Mario Lešnik

Vpliv uporabe antidriftnih šob in močil na učinkovitost delovanja herbicidov za zatiranje plevelov v poljščinah

GIS FFS SEMINAR 2015

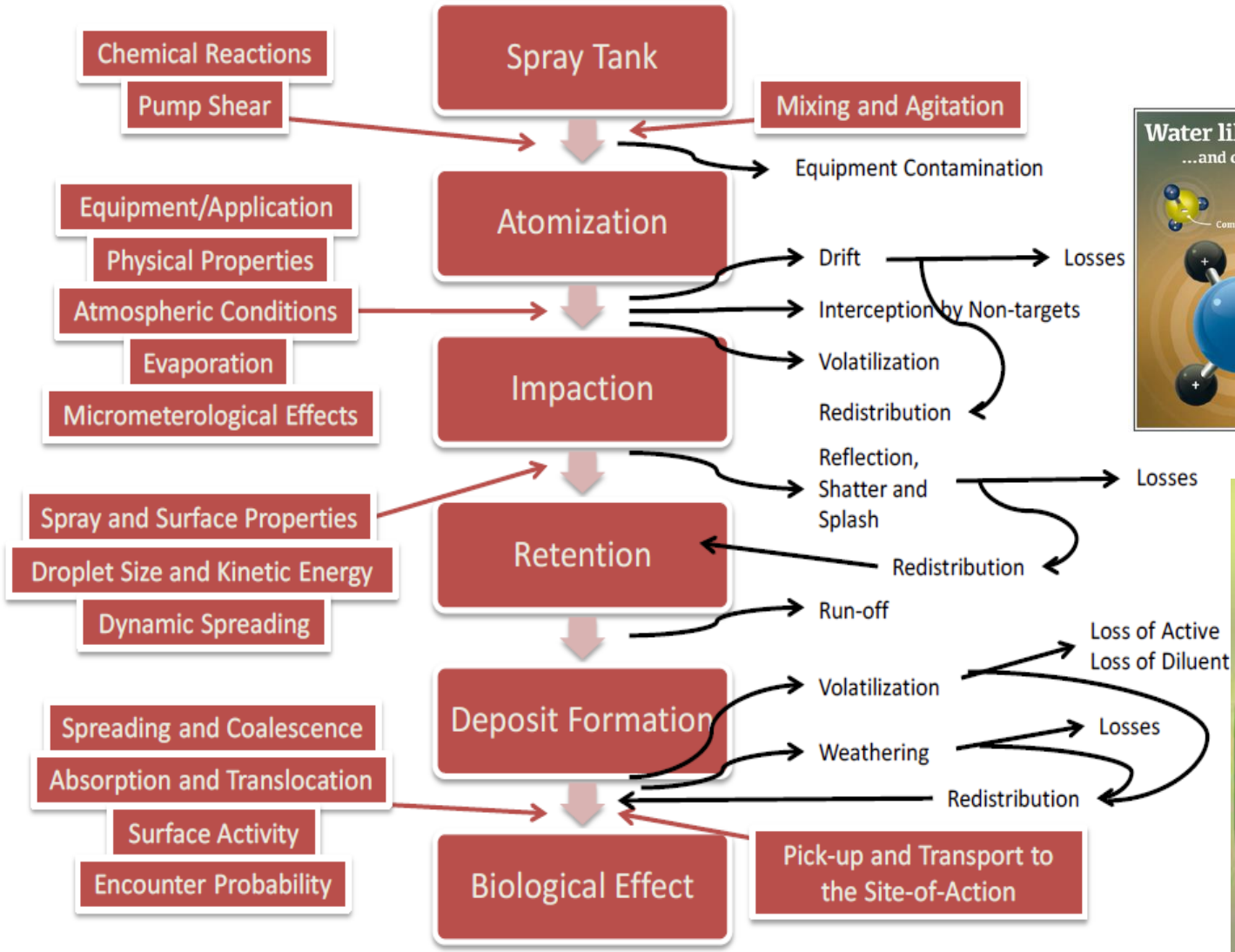
Ves slikovni material je povzet po prosto dostopnih dokumentih svetovalnih služb ZDA, GB in AU ter dokumentih industrije šob in dodatkov in niso avtorsko delo M. Lešnik

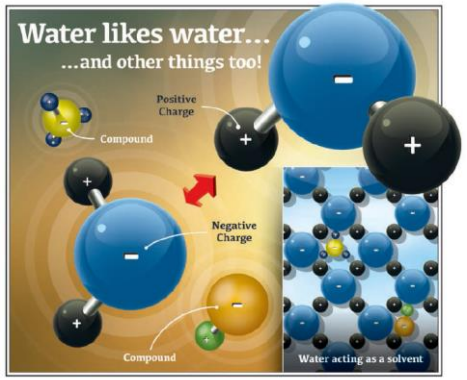






OBIČAJNI OPIS PROCESOV OD PRIPRAVE ŠKROPIVA DO BIOTIČENGA DELOVANJA AKTIVNE SNOVI FFS V RASTLINI





Ebert et al. 199



Figure 1. Pesticide applications include many complex relationships on the input and output of various steps in the process. The figure above depicts the steps involved in pesticide applications from the spray tank to the biological effect as described by Ebert et al. 1999.

V POLJEDELSTVU DRIFT HERBICIDOV OMEJUJEMO S:

POVEČEVANJEM VELIKOSTI KAPLJIC OB USTREZNEM DELNEM POVEČANJU PORABE VODE

PRILAGODITVIJO HITROSTI VOŽNJE

ZMANJŠANJEM RAZDALJE MED ŠOBAMI IN CILJEM

SPREMENJENIM IZSTOPNIM KOTOM CURKA BROZGE

OŽANJEM IZSTOPNEGA KOTA CURKA BROZGE

ŠKROPILNICAMI S ŠČITI

ŠKROPILNICAMI Z ZRAČNO PODPORO

UPORABA ANTIDRIFTNIH DODATKOV TANK-MIX

BARIERE IZ ENOLETNIH ALI VEČLETNIH RASTLIN
(ali varovalni pasovi travinja ob njivi 10 do 20 m)

Ne škropiti pri bočnem vetru s hitrostjo več kot 3 m/s

Ne škropiti v pogojih inverzije in visoke zračne vlage, kljub skoraj popolnemu brezvetrju





Škropljenje pod ščitom.
99 % redukcija zanašanja

Some booms cannot accommodate shrouds. In those situations, cones may be appropriate. Cones allow greater ground clearance for suspended booms and will not contaminate susceptible crops with spray residue on the shielding material. Protective cones have been shown to reduce drift by 30 to 50 per cent (Figure 81).

Uporaba ščitov različnih oblik



Figure 81. Shrouds and cones can reduce spray drift.

Shrouds – Shrouds reduce drift. In field testing, shrouds reduced drift from an 8001 tip applying 50 L/ha approximately 70 per cent (Figure 80). Drift from the finer spray produced by an 11001 tip was slightly greater. Unfortunately, no data is available on

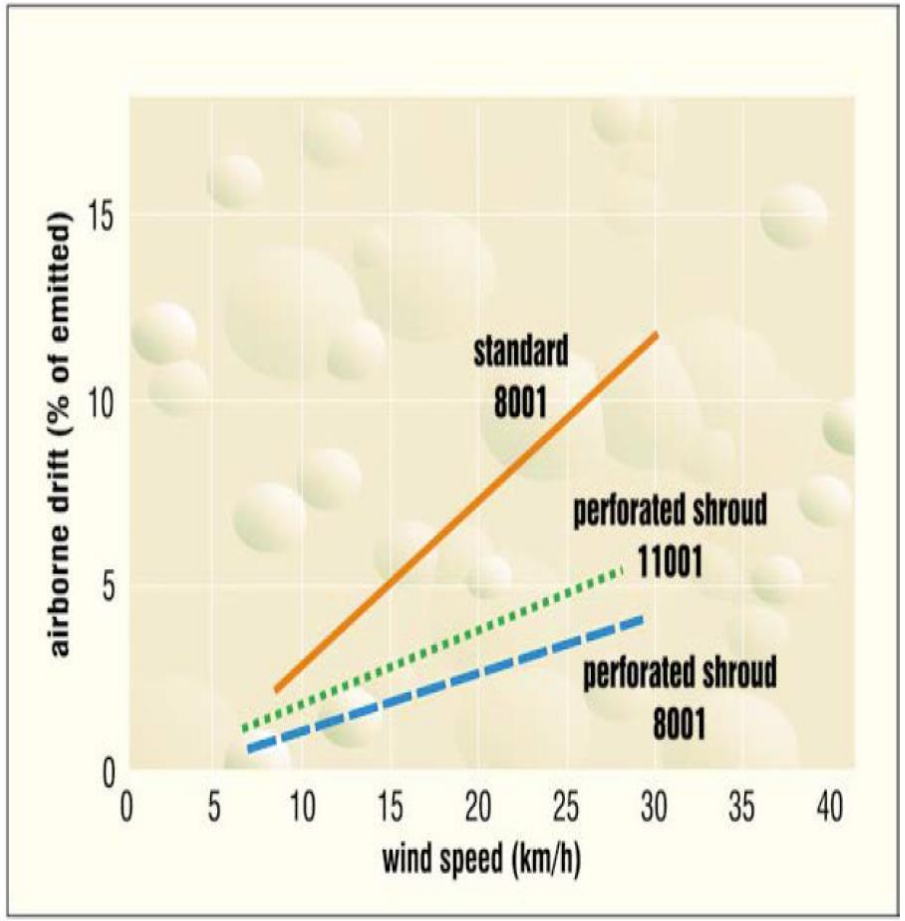


Figure 80. Reduction of drift with shrouds. Application volume was 50 L/ha.

Source 12



Eurofoil®

Manj pogosto uporabljene tehnične rešitve - pršilnik za poljščine

and the small droplets

Deposition on the leaves	Hydraulic 4110-14	danfoil
Top:		
Drops cm²	150	400
Size, mm	0,40	0,15
Bottom:		
Drops cm²	15	100
Size, mm	0,10	0,10

Deposition on the top and bottom of the leaves with a hydraulic sprayer, 180 l/ha and 3 bar pressure and a danfoil sprayer, 50 l/ha and 25 cm wc

The spray concept of the future

The Eurofoil atomizer was first introduced in 1999 as a successor to the familiar Danfoil atomizer. The Eurofoil atomizer was developed based on experiences from Danfoil customers and research institutions and provides a number of advantages relative to conventional nozzles.

The Eurofoil atomizer is patented

Analyses include a situation where the pesticide is most likely to drift, namely when sprayed on bare ground or weed spraying of low plants. In their experiment, Bygholm Research Center concluded that:

- Eurofoil produces a larger number of small droplets (100 microns) than the standard nozzle, but produces far greater energy than the standard nozzle, meaning droplets from Eurofoil can better reach the soil without drifting.

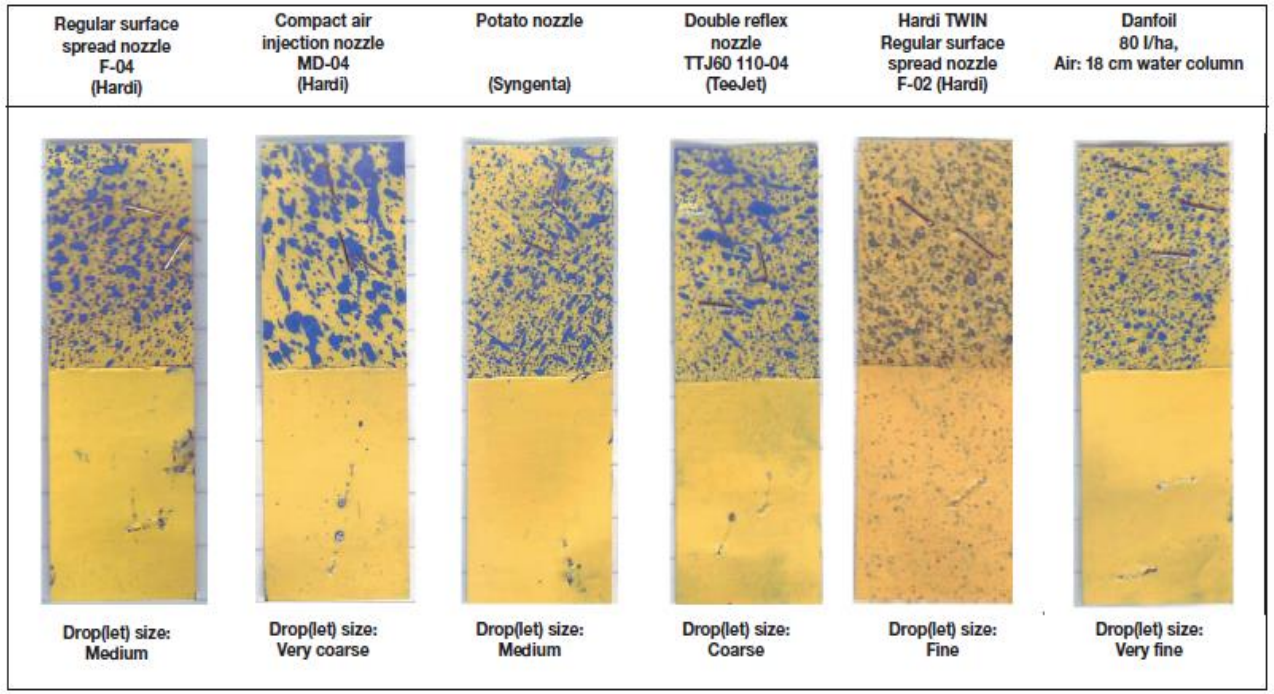


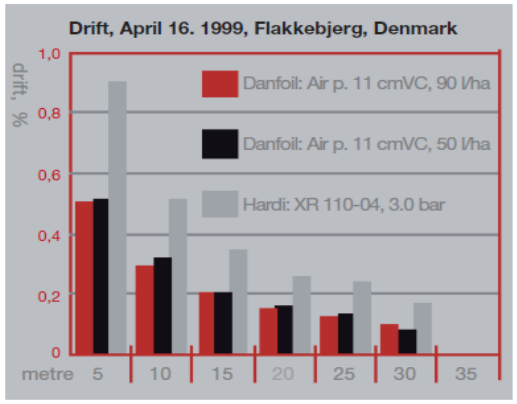
Eurofoil® vs. conventional nozzles

When using conventional spraying technologies, small and large droplet characteristic are as follows:

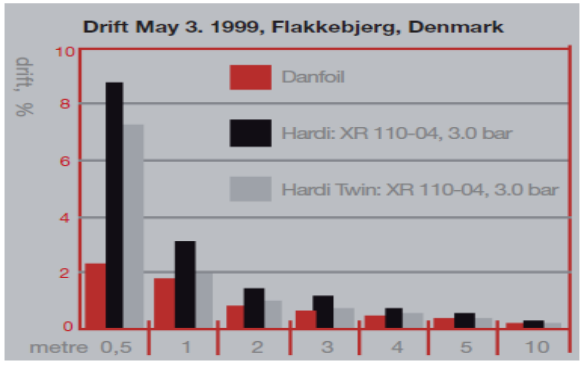
Properties of small and coarse droplets:

Properties	small droplets	coarse droplets
Vaporization	great	small
Wind sencitivity	high	low
Retention to leaves	great	small
Coverage when using the same liquid volume	great	less
Penetration into the crop	small	great
Kinetic energy	small	great

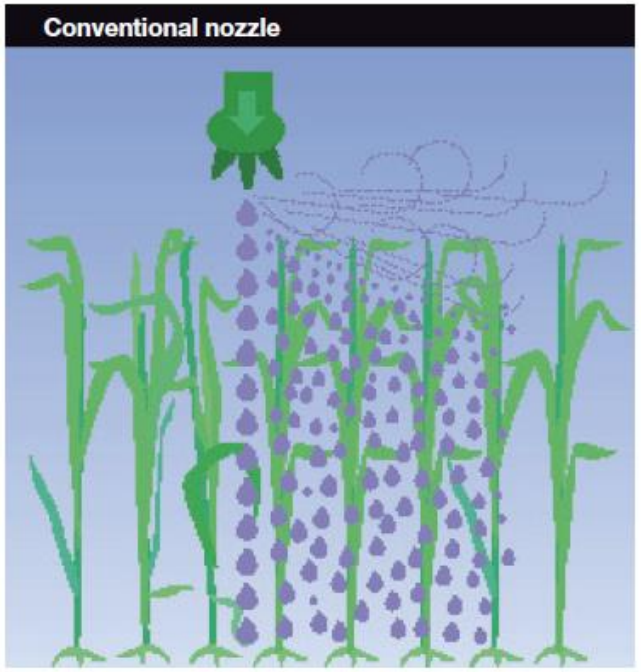




The diagram shows that drift from a Danfoil sprayer was about half the drift from a conventional sprayer fitted with TeeJet XR 110-04 nozzle. The average wind speed was 4,3-7,0 m/s. during the trials with three replications per each sprayer.



The diagram shows that drift from a Danfoil sprayer was about half the drift from a conventional sprayer fitted with TeeJet XR 110-04 nozzle, whereas it was at the same level as the drift from Hardi Twin except from the first metre. The average wind speed was 4.2-7.0 m/s. during the trials with three replications per each sprayer.





SPLOŠNA PRIPOROČILA ZA OMEJEVANJE DRIFTA HERBICIDOV V POLJEDELSTVU

- **Nanos herbicidov izvajamo v razmerah stabilne atmosfere (majhen vertikalni temperaturni gradient) s horizontalnimi hitrostmi vetra v pritlehni plasti od 0,1 do 3 m/s, to je od 0,3 do 10 km/h,**

- **- ob bočnem vetru do največ 2 m/s herbicide apliciramo, če uporabljamo standardne šobe (kapljice 200 – 300 μm) in do največ 5 m/s, če uporabljamo antidriftne šobe (kapljice VMD 500 – 700 μm),**

- **- pri hitrostih bočnega vetra med 3 do 5 m/s je tveganje za pojav fitotoksičnosti na sosednjih posevkih veliko,**

- **- izogibamo se nanosu v času temperaturne inverzije in pri visokih temperaturah (nad 25 °C),**

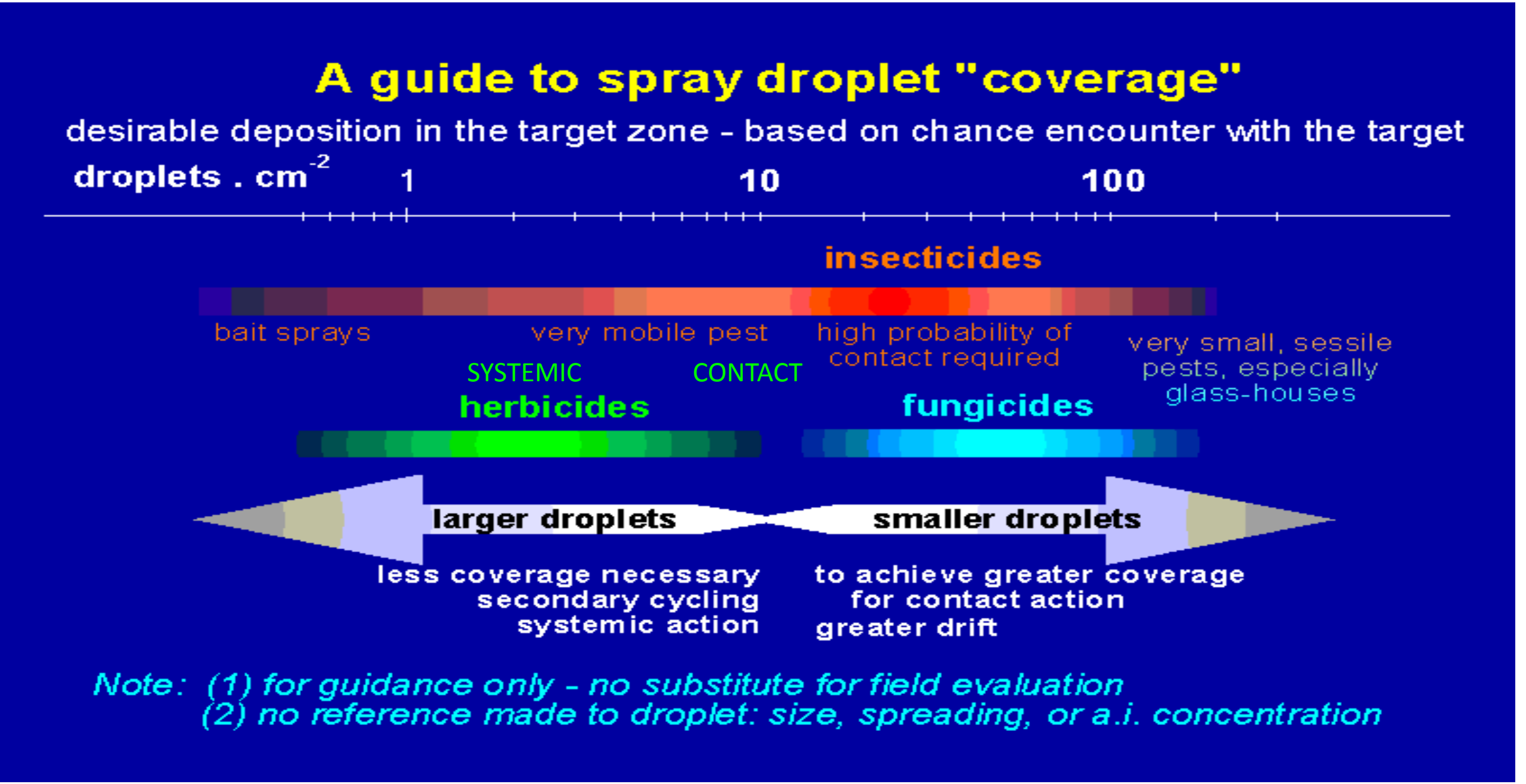
- **- z izogibanjem nanosu pripravkov pri hitrostih več kot 7 km/h, če so kapljice (VMD) drobnejše od 300 μm in pri hitrosti več kot 10 km/h, če so kapljice (VMD) drobnejše od 500 μm. (to velja za standardno zastarelo tehniko),**

- - p**ri hitrostih vetra nad 5 m/s herbicidov naj nebi nanašali niti ob uporabi antidriftnih šob z zelo velikimi kapljicami.**
- - za drift zelo tveganih herbicidov (glifosat, 2,4-D, dikamba, klopiralid, klomazon, ….) naj nebi nanašamo, če bočni veter piha več kot 2 m/s (nujna uporaba zelo velikih kapljic).
- **- lahko uporabimo pravilo, da za vsakih dodatnih 0,5 m/s hitrosti bočnega vetra premer (VMD) kapljic povečamo za 50 μm, začenši pri izhodišču 250 μm in hitrosti en m/s. Pri treh metrih na sekundo bi torej za varno delo potrebovali 450 μm velike kapljice.**

Pros and cons of various drift-reducing strategies

Drift reducing strategy	Pro	Con
Wait for ideal weather conditions	Best strategy	May have to wait too long
Reduce travel speed	More entrainment of the spray cloud, protects fines	Slower work rates
	Other drift reducing strategies (shrouds, air-assist, low-drift tips, etc.) become more effective	At constant carrier volume, smaller nozzle needed, which produces finer spray
Use low-drift tips	Fewer drops prone to drifting	Possible changes in spray retention and efficacy
	No change in work rate	Need extra set of tips
Increase carrier volume	At same travel speed, requires larger nozzle, which produces less drift-prone spray	Reduced efficiency due to more frequent re-fills
	Spray solution more diluted, creating less potent drift	Reduced effectiveness of glyphosate sprays
Install protective shield	Protects spray from wind	Reduced visibility of spray nozzles and patterns
	Permits use of conventional spray nozzle and volumes	Shroud decontamination needed between crops or herbicides
Lower boom height	Spray less exposed to wind	May be difficult to maintain proper clearance on self-supporting boom
Reduce pressure	Creates coarser spray	Must reduce travel speed to maintain constant carrier volume
	No need for extra set of tips	Pattern may change reduced pressure range available for automatic flow controllers
Low-drift adjuvant	Creates coarser spray	Creates non-uniform spray pattern
	No need to change nozzles or pressure	May degrade under pump shear stress
	May reduce droplet rebound	May need to raise boom to correct pattern

OBIČAJNA PRIPOROČILA GLEDE OPTIMALNEGA ŠTEVILA ZADETKOV NA CM2 IN VELIKOSTI KAPLJIC ZA RAZLIČNA FFS



Načrtovanje izvedbe aplikacije herbicidov je povezano s poznavanjem načina vstopanja in mobilnosti herbicidne aktivne snovi. Teoretično pri visokosistemičnih herbicidih ni potrebno zagotoviti tako visokega nivoja pokritosti in gostote števila impaktov, kot je to potrebno pri kontaktno delujočih herbicidih.

Kontaktni herbicidi	Vmesni učinek	Visoko sistemični herbicidi
Bentazon, piridat, parakvat, dikvat, bromoksinil, ioksinil, …..	Desmedifam, fenmedifam, Etofumesat, izoksaflutol, fluroglikofen, pinoksaden, …. glufosinat	Glifosat, 2,4-D, dikamba, MCPP, MCPA, …….. klopiralid, fluroksipir, pikloram, flurenol, ….
Laktofen, oksifluorfen, acifluorfen, …..	Imazakvin, imazamoks, imazapir, ……	Sulfonilsečnine
	Karfentrazon, klomazon, oksadiazon, fenoksaprop, kvinklorak, ….	Cikloksidim, setoksidim, tepraloksidim, fluazifop, diklofop, …
	Flukarbazon, propoksikarbazon	Florasulam, metosulam
	Dimetenamid, napropamid, pentoksamid, fomesafen, propizamid, …..	Mezotrion, sulkotrion, tembotrion, topramezon, …
	Metribuzin, metamitron	Triazini…….
	Diuron, linuron, izoproturon, ..	

Influence of droplet spectra on the efficiency of contact and systemic herbicides

M. Prokop[1], K. Veverka[2]

[1]State Phytosanitary Administration, Division of Plant Protection Equipment, Brno, Czech Republic
[2]Mendel University of Agriculture and Forestry in Brno, Czech Republic

ABSTRACT

The effect of droplet spectra on efficiency of contact and systemic herbicides was evaluated. As a model components were used: mixture of clethodim 240 g/l + surfactant (90% raps fluid, 10% polyetoxyl esters); bentazon 600 g/l and bentazon 480 g/l + Wettol LF 150 g/l. The effect of droplet spectra on *Elytrigia repens* (L.) Desv. was evaluated using systemic herbicide (clethodim 240 g/l + surfactant). No significant differences of the efficiency were observed between different droplet sizes at the treatments of mixture of clethodim + adjuvant between very different droplet size ranging from VMD = 193 µm to VMD = 929 µm. The effect of droplet spectra on *Chenopodium album* L. and *Galium aparine* L. was evaluated using contact herbicides (bentazon 600 g/l and bentazon 480 g/l + Wettol LF 150 g/l). Six droplet spectra, ranging from VMD = 183 µm to VMD = 911 µm, were used. The efficiency significantly increased with smaller droplet sizes. The worst results were achieved by droplet spectra of 586 µm and 911 µm for both bentazon 600 g/l and bentazon 480 g/l + Wettol LF 150 g/l. Effect of droplet spectra is more pronounced in contact compounds. Translocation of systemic compounds may be the main mechanism that nullifies the effect of the droplets size and lower leaf coverage.

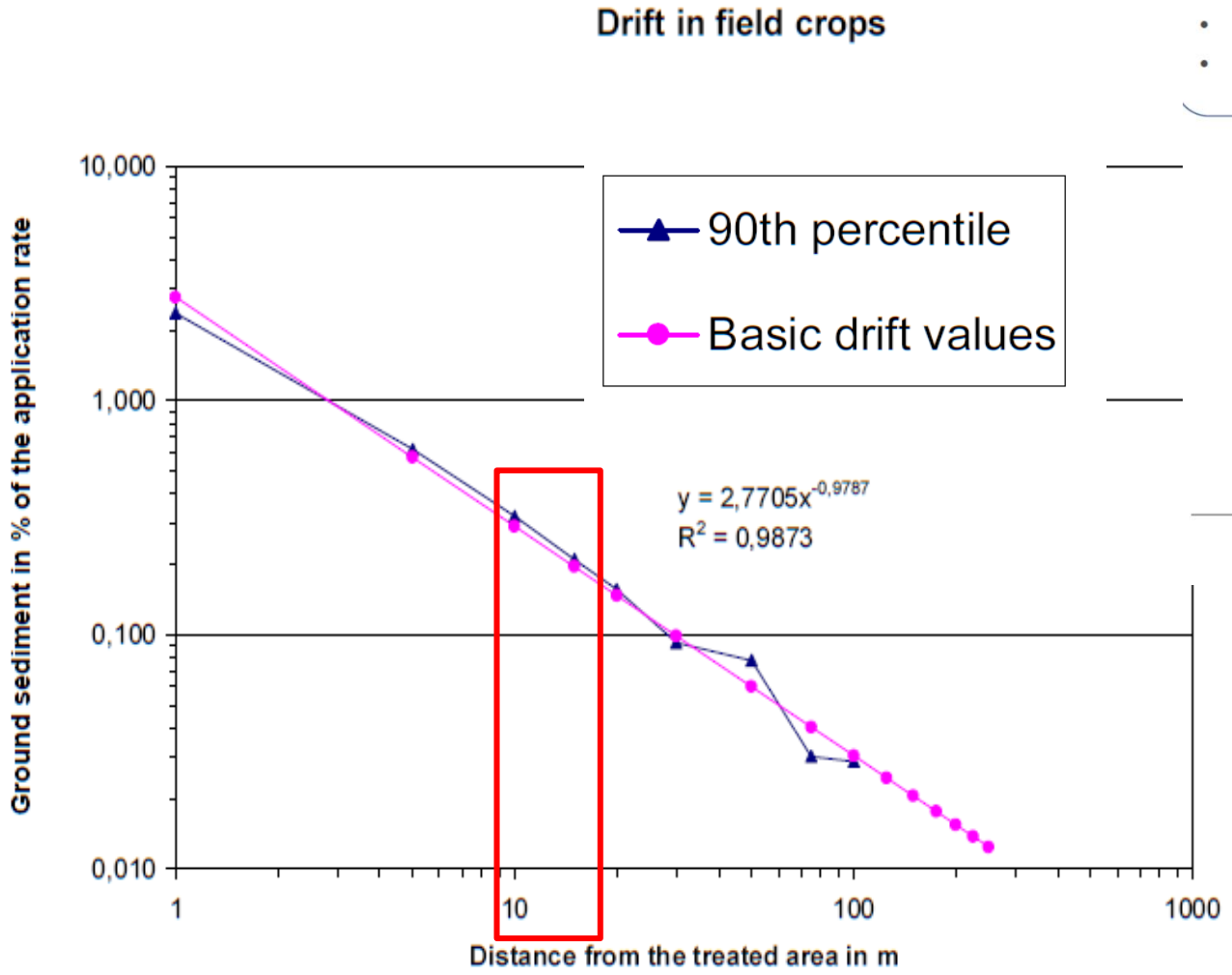
Keywords: pesticide application; droplet spectra; *Elytrigia repens*; *Galium aparine*; *Chenopodium album*; clethodim; bentazon; raps fluid

Nekatere plevele označujemo kot težavne glede možnosti za dobro omočenje njihove površine s škropilno brozgo. Pogosto se srečamo z znižano učinkovitostjo herbicidov zaradi goste poraščenosti z dlačicami ali zaradi izrazite voščenosti listov.

Enoletni močno poraščeni z dlačicami	Enoletni z bolj voščeno povrhnjico	Večletni močno poraščeni z dlačicami	Večletni z bolj voščeno povrhnjico
Določene dresni, nekatere ambrozije, suholetnice, hudoletnice, grašice, pasja zelišča, metlovci, zebrati, lakote, mrtve koprive, jetičniki, smiljke, ….	Samosevna ogrščica in druge križnice, mak, metlike in lobode, določene dresni, mlečki, tolščaki, zlatice, nedotike, …	Mete, nekateri vrbovci, nekateri osati, koprive, gabezi, lučniki, zavratnice, gadovci, ….	preslice, nekateri slaki, nekatere dresni in dresniki, trpotci, pijavčnice, lapuh, regačice, poprovniki, dragatuše, praproti, čmerike, zlatice, divji luki, ….
Divji ovsi, stoklase, nekateri muhviči, srakonje, prosa, …..	Kostrebe, njivski repi, srakoperci, nekatere ostrice in šaši, ljuljke in številne trave, komelina, …	Pirnice, šašulice, medene trave, nekateri šaši, …	Divji sirek, pirnice, šaši in ločki, pesjaki, številne trave (ljuljke), …..

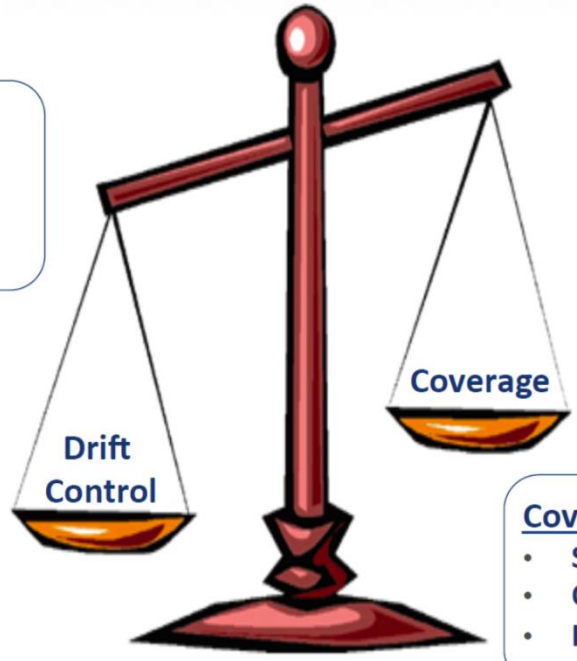
http://www.jki.bund.de/en/startseite/institute/anwendungstechnik/abdrift-eckwerte.html

Basic drift values NEMČIJA



The Balance

Drift Control:
- Larger Droplets
- Systemic Chemicals
- Herbicides

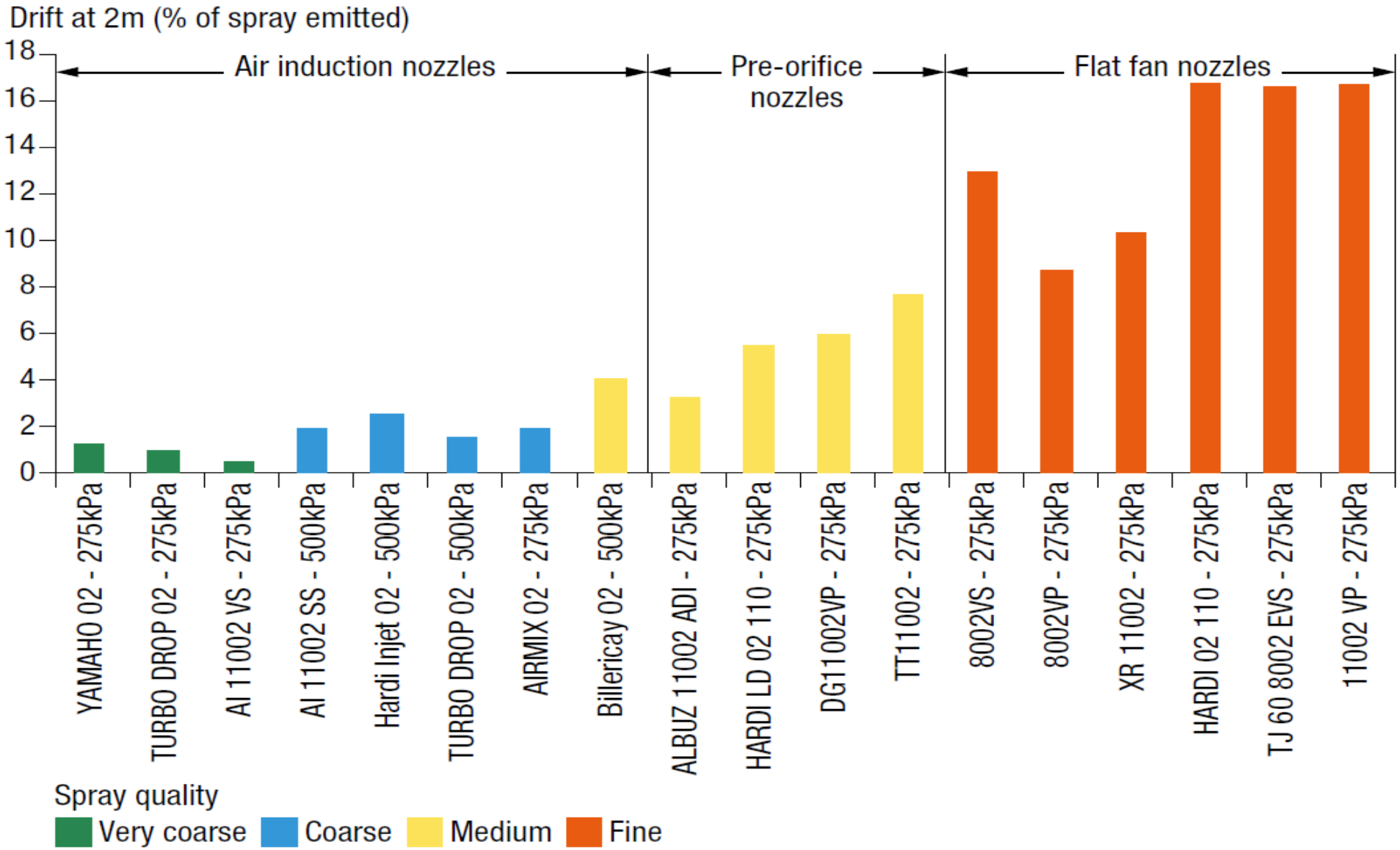


Coverage:
- Smaller Droplets
- Contact Chemicals
- Insecticides Fungicides

Drift Control vs. Coverage

Pri delu v priporočenih atmosferskih razmerah (veter do 2 m/s) znaša zanašanje pri 10 m od roba njive manj kot 0,1 %, pri bočnem vetru med 2 in 3 m/s naraste pri 200 µm kapljicah na 1 % in pri bočnem vetru med 3 in 5 m/s naraste zanašanje pri 200 µm velikih kapljicah nad 3 %.

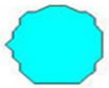
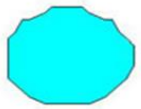
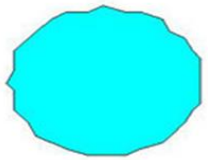
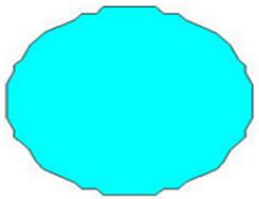
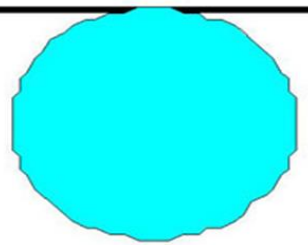
FIGURE 1 **Impact of spray quality (droplet size) generated from a range of nozzle types on the proportion of spray drifting two metres from the site of application.**



SOURCE: CHRIS O'DONNELL, CENTRE FOR PESTICIDE APPLICATION AND SAFETY (CPAS) UNIVERSITY OF QUEENSLAND

OBIČAJNI VELIKOSTNI RAZREDI KAPLJIC

VELIKOST KAPLJIC VPLIVA NA OBLIKOVANJE IN ZNAČILNOST OBLOGE FFS

VERY FINE	VF		< 150 µm (Fog)
FINE	F		177 - 237 µm
MEDIUM	M		238 - 307 µm (Light Rain)
COARSE	C		308 - 459 µm
VERY COARSE	VC		459 - 600 µm
EXTREMELY COARSE	EC		>600 µm (Heavy Rain)



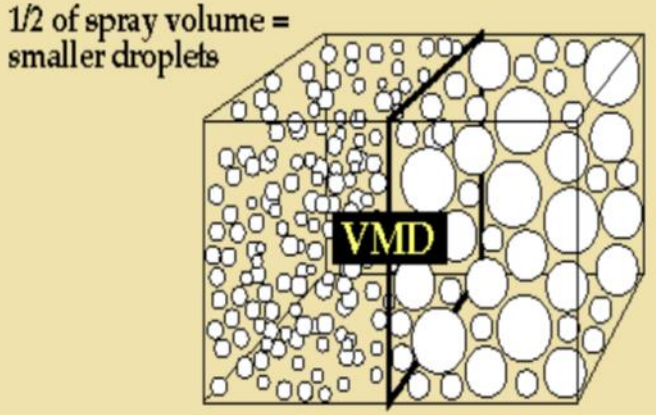
VELIKOST KAPLJIC VPLIVA NA OBLIKOVANJE IN ZNAČILNOSTI OBLOGE FFS

Drift-reducing nozzles and their spray coverage (30 psi and 0.4 gpm)

Nozzle type	15 gpa	25 gpa	35 gpa	45 gpa
Extended Range (XR11004)				
Turbo Teejet (TT11004)				
Turbo Twinjet (TTJ60-11004)				
Air Induction Extended Range (AIXR11004)				
Air Induction (AI11004)				
Turbo Teejet Induction (TTI11004)				

Najbolj pogosto uporabljen opisni parameter za določanje spektralnih značilnosti kapljic šob je VMD vrednost – povprečni volumski premer, ki predstavlja statistično srednjo vrednost, kjer je polovica izbrizgane tekočine v obliki kapljic, ki so manjše od VMD in polovica tekočine v obliki kapljic, ki so večje od VMD

VMD
Volume Median Diameter*



*In general, the bigger the VMD, the bigger the droplets.

OSNOVNE STRUKTURE POLJEDELSKIH ŠOB

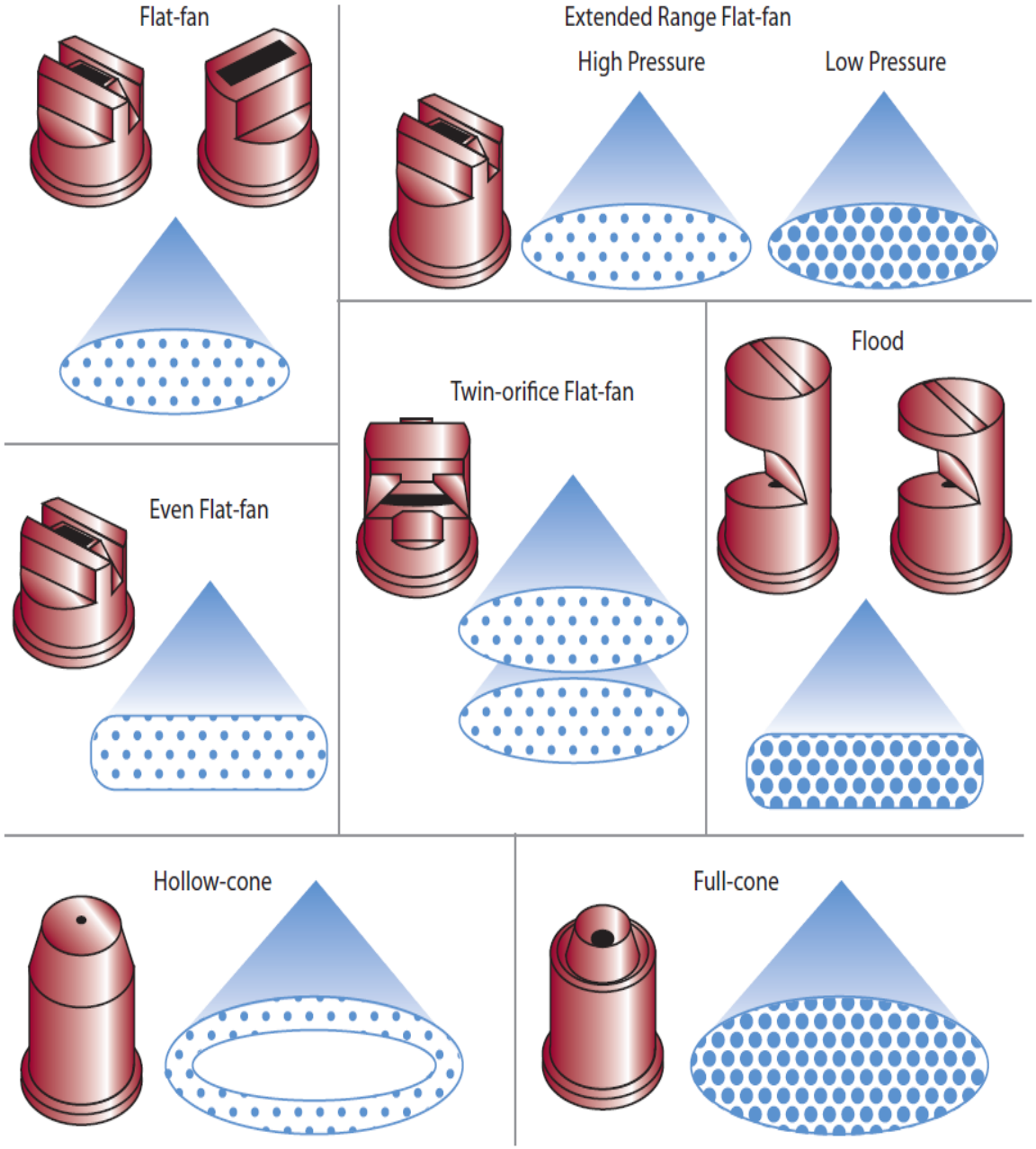


Figure 2. Relative droplet size for nozzles shown in patterns.

Nekateri izpostavijo, da antidriftne šobe niso za kontaktne herbicide

Table 7. Nozzle guide for spraying.

	Broadcast Spraying							
	Extended Range Flat Fan	Standard Flat Fan	Drift Guard Flat Fan	Twin Flat Fan	Turbo Flood Wide Angle	Full Cone	Flood Nozzle Wide Angle	Raindrop Hollow Cone
Herbicides								
Soil-incorporated	Good		Very Good		Very Good	Very Good	Good	Good
Pre-emerge	Very Good (on low pressure)	Good	Very Good		Very Good	Very Good		Good
Post-emerge Contact	Good	Good		Very Good				
Post-emerge Systemic	Very Good (on low pressure)	Good	Very Good		Very Good			Good
Fungicides								
Contact	Very Good	Good						
Systemic	Very Good (on low pressure)		Very Good		Very Good			
Insecticides								
Contact	Good	Good		Very Good				
Systemic	Very Good (on low pressure)		Very Good		Very Good			

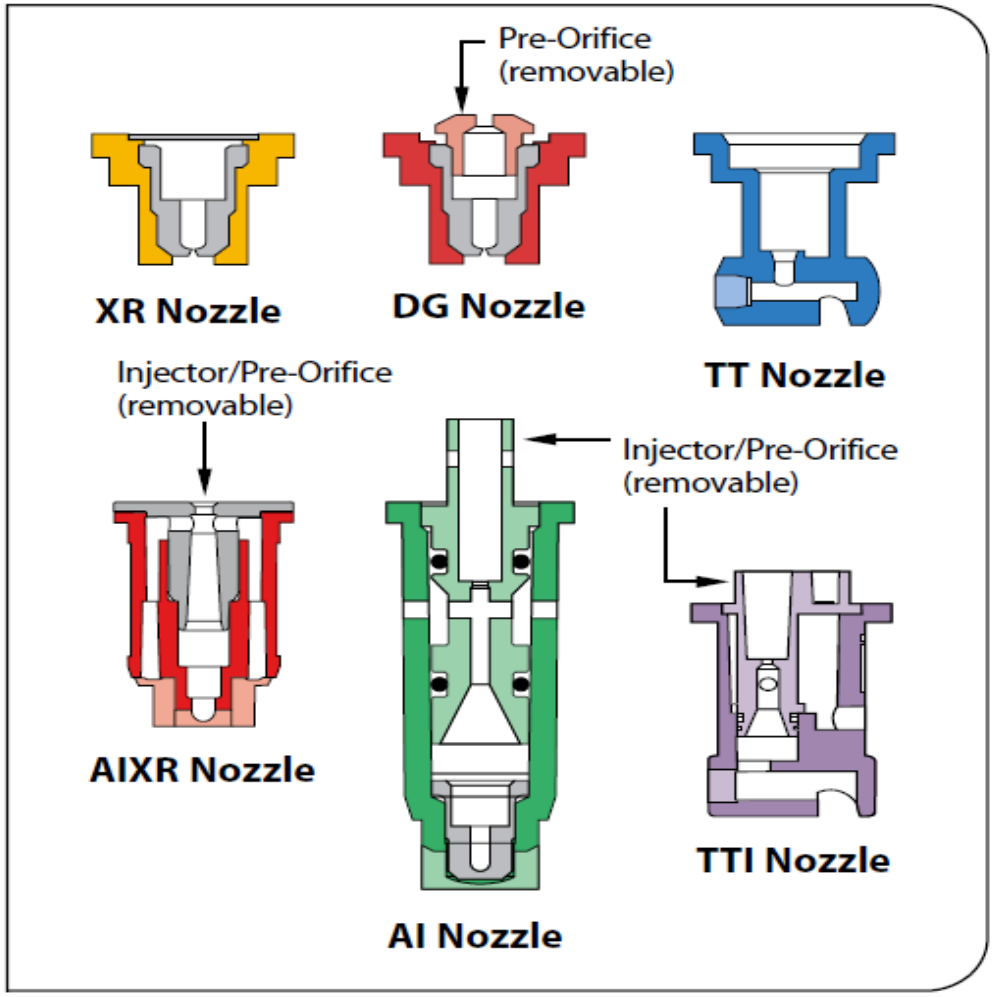
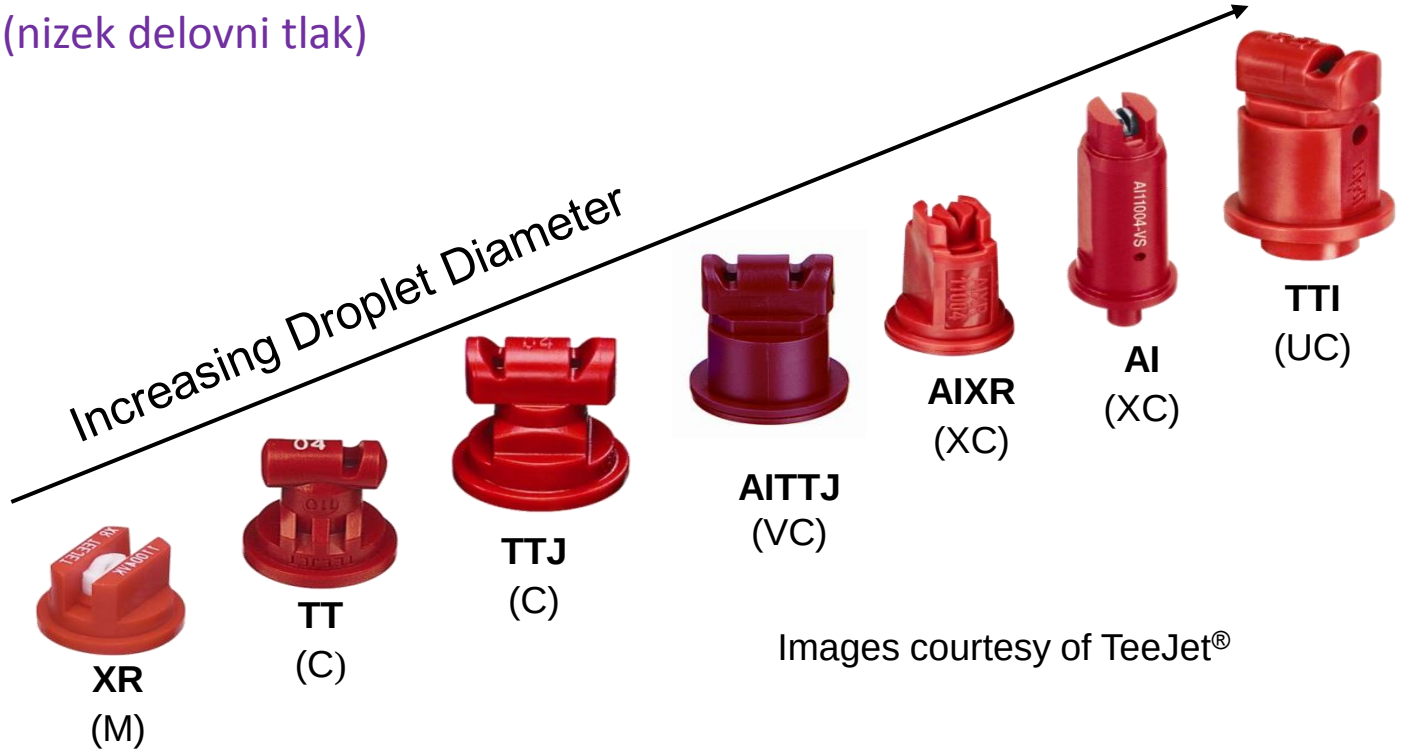


Figure 3: XR, DG, TT, AIXR, AI and TTI nozzles (sectional drawings).

Običajni tipi antidriftnih šob

6 TIPOV ŠOB (DR – stopnja redukcije drifta)

- Standardna XR (velik delež zelo majhnih kapljic)
- Antidriftna s predkomoro DG (Pre-orfice) DR do 50 %
- Standarna z antidrift učinkom zaradi prečne komore za redukcijo tlaka (TT - turbo) DR do 50 %, večja izenačenost kapljic
- Venturi kratka (AIXR) (Pre-orfice + injektor) DR do 70%, srednji delovni tlak
- Venturi dolga (AI) (injektor) DR do 80%, velik delovni tlak
- Venturi kompakt TTI (Pre-orfice + injektor + prečna komora) DR do 95% (nizek delovni tlak)



Images courtesy of TeeJet®

VMD_{50} rating is based on an 04 orifice at 40 PSI

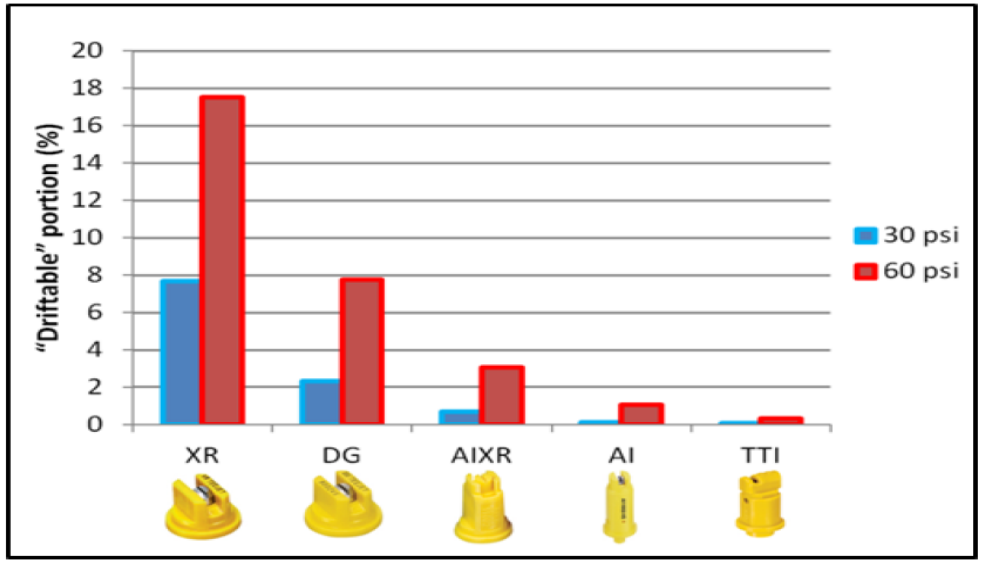


Figure 2. Effect of nozzles on drift-prone (≤100 µm) droplet production (*McGinty, J.A., Baumann, P.A., Hoffman, W.C., & Fritz, B.K. (2014) Unpublished data*).

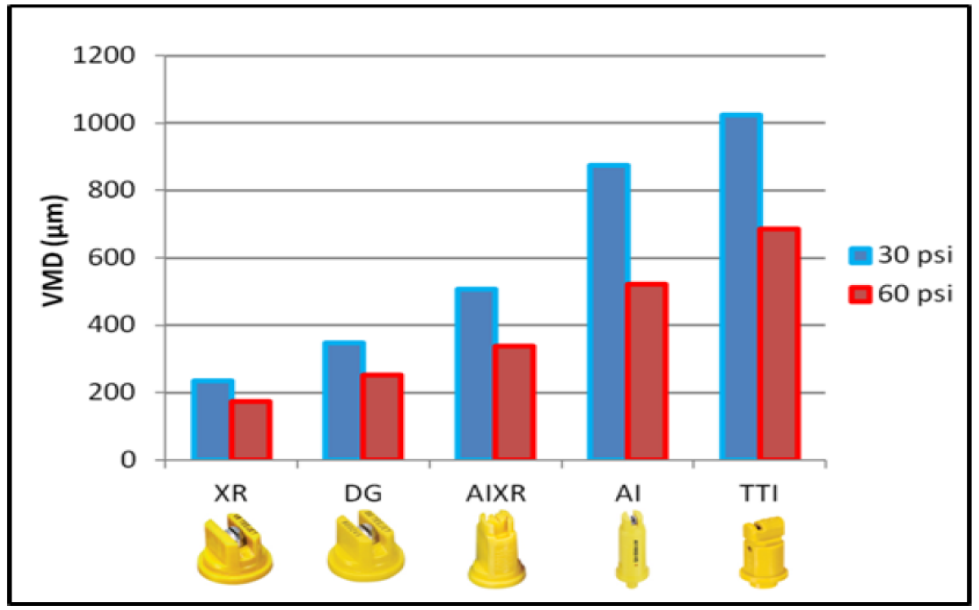


Figure 1. Effect of nozzles on VMD (*McGinty, J.A., Baumann, P.A., Hoffman, W.C., & Fritz, B.K. (2014) Unpublished data*).

Figure 3.15 Air Induction Nozzle Model A

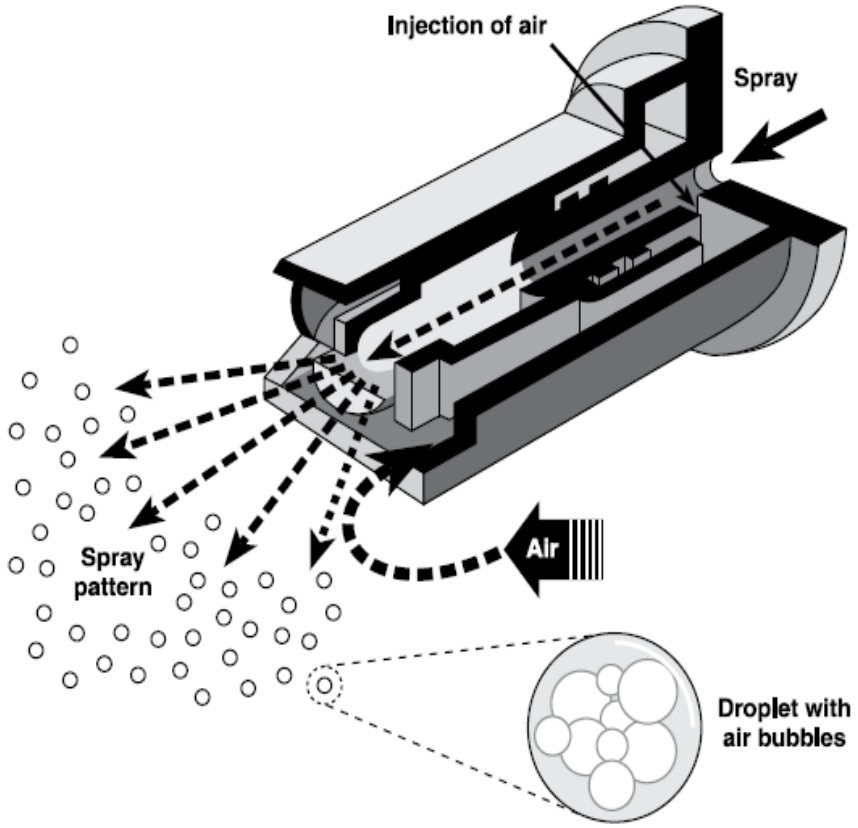
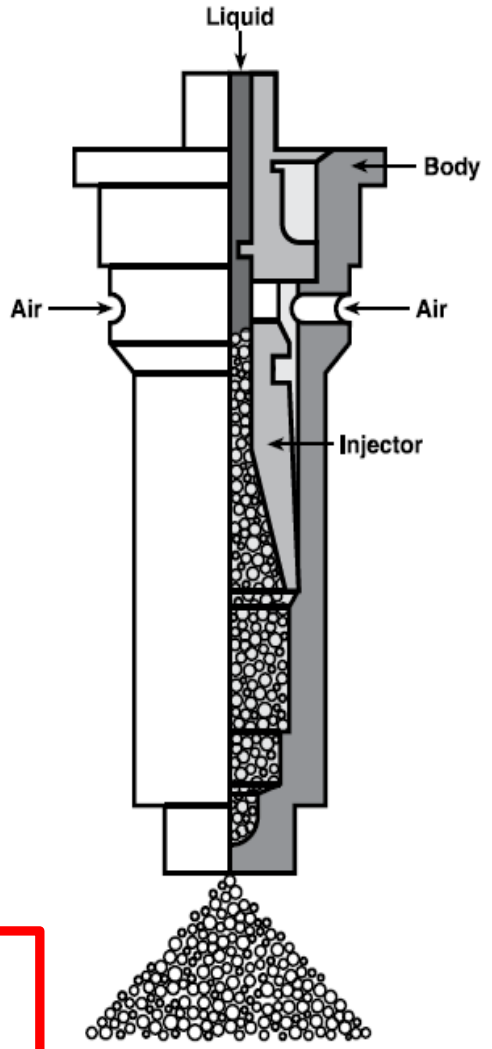


Figure 3.16 Air Induction Nozzle Model B



Air induction nozzles work better at the higher end of the pressure range as it allows them to include more air into the liquid. They must never be used below the minimum recommended pressure to prevent spraying pattern changes. Because air induction nozzles need to be operated at higher pressures to allow air bubble creation, it makes sense to choose a lower nozzle flow rate from the one currently used, as higher pressure alone will result in higher flow rates.

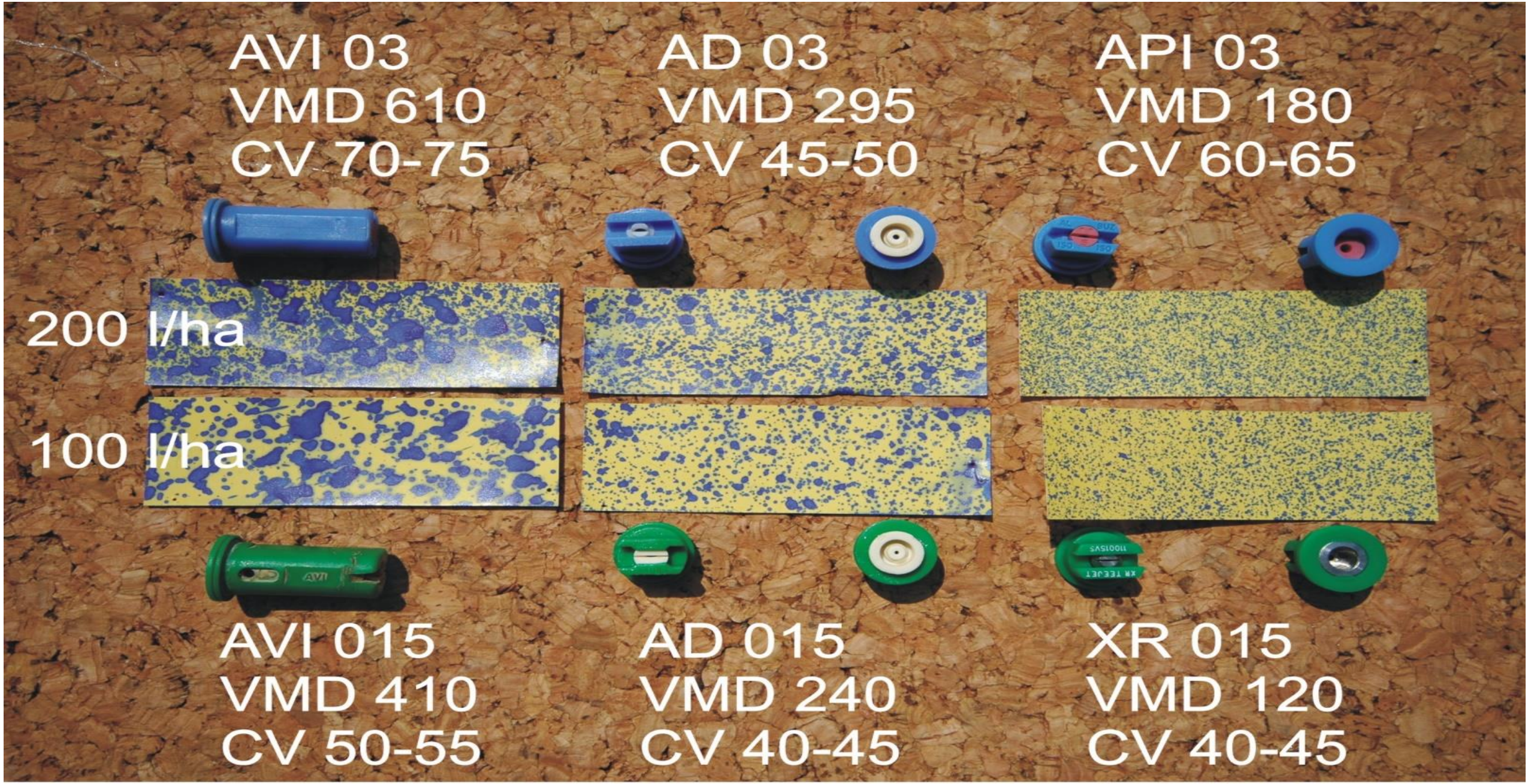
Okvirne vrednosti VMD za tri različne tipe šob v odvisnosti od delovnega tlaka; PV* – poraba vode na hektar pri vožnji s hitrostjo 7 km/h

POLJEDELSTVO

M. Lešnik

ISO razred pretoka šobe	Tlak (bar)	Pretok (l/min)	PV* (l/ha)	Standardne šobe	Antidriftna šoba s predkomoro	Antidriftna šoba tipa venturi
ISO 110-04	1	0,92	158	255-285	475-505	855-890
ISO 110-04	2	1,31	225	225-255	380-410	730-760
ISO 110-04	3	1,60	274	210-240	320-350	570-600
ISO 110-04	4	1,85	317	185-215	270-300	530-560
ISO 110-04	5	2,06	353	170-200	250-285	450-485
ISO 110-03	1	0,69	118	215-245	405-435	775-805
ISO 110-03	2	0,98	168	195-225	330-360	620-650
ISO 110-03	3	1,20	206	165-195	260-290	480-515
ISO 110-03	4	1,39	238	145-175	240-270	420-450
ISO 110-03	5	1,55	266	135-165	215-240	390-420
ISO 110-02	1	0,46	79	185-215	360-390	720-750
ISO 110-02	2	0,65	111	125-150	285-310	610-640
ISO 110-02	3	0,80	137	115-145	210-240	460-490
ISO 110-02	4	0,92	158	110-140	185-215	390-420
ISO 110-02	5	1,02	175	105-135	160-190	355-385
ISO 110-015	1	0,35	60	155-185	265-295	600-630
ISO 110-015	2	0,49	84	110-140	245-270	470-500
ISO 110-015	3	0,60	103	100-130	200-230	300-330
ISO 110-015	4	0,69	118	90-120	165-195	250-280

VIZUALIZACIJA INTERAKTIVNEGA UČINKA KOLIČINE VODE IN TIPA ŠOBE (POKROVNOST NA WSP LISTIČU) M. Lešnik

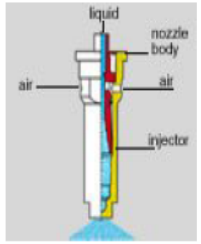


BCPC / ASAE Nozzle Droplet Classification

Mr Nozzle

LECHLER

Lechler ID
High Pressure Air Induction



Pressure Bar / Nozzle Size	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8
ID 120-01			C	C	C	C	C	C	C	M	M	M	M
ID 120-015			VC	C	C	C	C	C	C	C	C	C	M
ID 120-02			VC	VC	C	C	C	C	C	C	C	C	C
ID 120-025			VC	VC	VC	VC	VC	C	C	C	C	C	C
ID 120-03			VC	VC	VC	VC	VC	VC	C	C	C	C	C
ID 120-04			XC	VC	VC	VC	VC	VC	VC	VC	C	C	C
ID 120-05	XC	XC	XC	XC	VC	VC	VC	VC	VC	VC	VC	VC	VC
ID 120-06	XC	XC	XC	XC	XC	XC	VC	VC	VC	VC	VC	VC	VC
ID 120-08	XC	XC	XC	XC	XC	XC	XC	VC	VC	VC	VC	VC	VC



Lechler IDK
Low Pressure Air Induction

MICRONS	
VF	<144
F	144 - 235
M	236 - 340
C	341 - 403
VC	404 - 502
XC	>502

Pressure Bar / Nozzle Size	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
IDK 120-01		C	C	C	M	M	M	M	M	F	F
IDK 120-015		C	C	C	C	M	M	M	M	F	F
IDK 120-02		VC	C	C	C	C	M	M	M	M	M
IDK 120-025		VC	VC	C	C	C	C	M	M	M	M
IDK 120-03		VC	VC	VC	C	C	C	C	M	M	M
IDK 120-04	XC	VC	VC	VC	VC	C	C	C	C	C	M
IDK 120-05	XC	VC	VC	VC	VC	VC	C	C	C	C	M



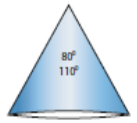
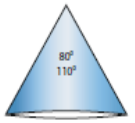
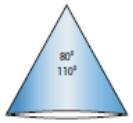
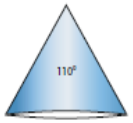
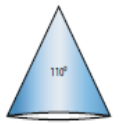
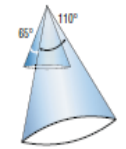
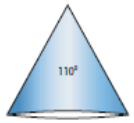
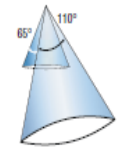
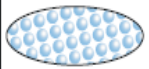
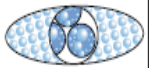
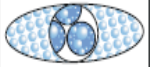
Lechler IDKT - TWIN
Low Pressure Air Induction

Pressure Bar / Nozzle Size	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
IDKT 120-03		C	C	C	C	M	M	M	M	F	F
IDKT 120-04	VC	VC	C	C	C	C	M	M	M	M	M
IDKT 120-05	VC	VC	VC	C	C	C	C	M	M	M	M



Lechler AD
Pre Orifice Low Drift

LOW CROPS: FLAT NOZZLES

TYPE OF NOZZLES	AXI WIDE RANGE FLAT SPRAY NOZZLE	FAST CAP AXI FLAT NOZZLE WITH CAP	APE FLAT SPRAY NOZZLE STANDARD	ADI DRIFT REDUCTION FLAT FAN NOZZLE	CVI LOW PRESSURE ANTI-DRIFT FLAT FAN NOZZLE	CVI-TWIN ANTI-DRIFT FLAT SPRAY NOZZLE AIR INDUCTION LOW PRESSURE	AVI 110 ANTI-DRIFT FLAT FAN NOZZLE	AVI-TWIN BI-JET ANTI-DRIFT VENTURI
								
SPRAY PATTERNATION								
DROPLETS SIZE CHARACTERISTICS								
DRIFT HAZARDS	Medium	Medium	Medium	Low	Very Low	Medium	Very Low	Medium
PRESSURE RANGE	1,5 - 2 bar	1,5 - 2 bar	2 - 3 bar	2 - 3 bar	1,5 - 3 bar	1,5 - 3 bar	3 - 5 bar	3 - 5 bar
HERBICIDES – Incorporated treatement	Good	Good	Good	Very Good	Very Good	Very Good	Very Good	Very Good
HERBICIDES – Taken	Very Good*	Very Good*	Very Good*	Very Good	Good	Good	Good	Good
HERBICIDES – Contact	Good	Good	Good	Very Good	Good	Very Good	Good	Very Good
HERBICIDES – Systemic	Very Good*	Very Good*	Very Good*	Very Good	Very Good	Very Good	Very Good	Very Good

HYPRO®
TECHNOLOGY ON TARGET

Nekateri definirajo uporabnost šob tudi glede na tip škropilne brozge

Spray Nozzles Selection Guide

What are you spraying?	When are you spraying?	Are you using an adjuvant?	What type of adjuvant are you using?	Is your chemical Contact or Systemic?	Primary Concern: Drift	Primary Concern: Coverage
Fertilizer Plant Nutrients	Pre-Emerge				Hi-Flow	Hi-Flow
	Post-Emerge				ESI Six Stream	ESI Six Stream
Herbicides Weed Control	Pre-Emerge or Post-Emerge	Yes	Solution Based	Contact	Ultra Lo-Drift	GuardianAIR
				Systemic		
			Suspension Based	Contact	Guardian	Guardian
				Systemic		
		No		Contact	Ultra Lo-Drift	GuardianAIR
				Systemic		
Insectide/ Fungicide Plant Health	Post-Emerge	Yes	Solution Based	Contact	GuardianAIR	GuardianAIR Twin
				Systemic		
			Suspension Based	Contact	Guardian	Guardian
				Systemic		
		No		Contact	GuardianAIR Twin	GuardianAIR Twin
				Systemic	GuardianAIR	


Hi-Flow


ESI Six Stream


Ultra Lo-Drift


Guardian


GuardianAIR


GuardianAIR Twin

http://www.spraytips.co.uk/_-Twin-Fan-Air-Infusion-_product/?pid=1597

Trendi v zadnjem času - veliko novih verzij šob z dvojnim curkom

Twin Fan Air Infusion

Twinfan is an air-infusion nozzle which draws in air to provide large aerated droplets which can shatter upon target impact and disperse rather than bounce as with traditional large droplets, to provide improved coverage and penetration with reduced drift. This design provides twin flat fan sprays for a double angle of attack to give improved penetration.



Turbo Drop Twin



Lechler IDTA





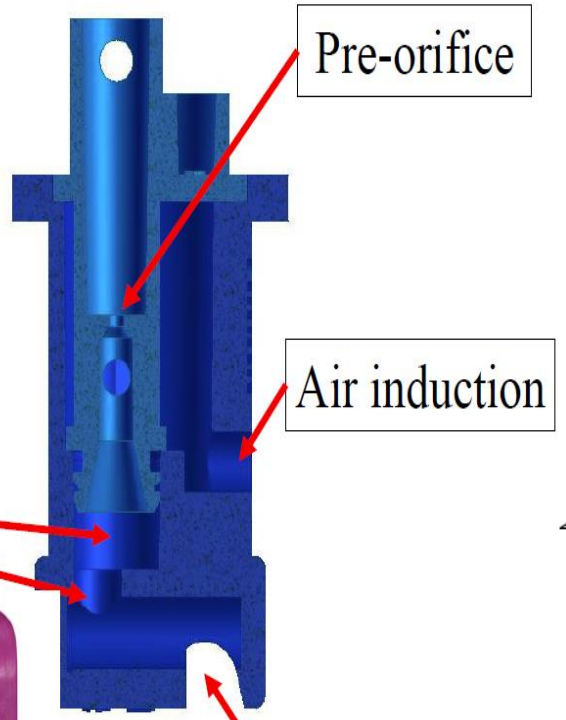
A new 035 size for the Hypro GuardianAIR Twin spray nozzle range will be shown for the first time at Cereals 2013, reports the company. The versatile drift-reducing nozzle with the finest droplets offers growers a unique balance between good spray coverage and drift reduction, with a spray quality that is ideal for the majority of spring and summer spraying targets, it claims.

The new 035 size, which joins an existing range of five sizes from 025 to 08, is ideally suited to applying 100 litres/ha at 16 kph with three bar pressure – a set up commonly used with the single inclined spray version of the GuardianAIR.

Trendi v zadnjem času

Next Generation Air Induction Nozzles:

- Next generation:
  - More compact
  - Larger drops
  - Operates at lower pressures
  - Percentage of fines do not increase with pressure



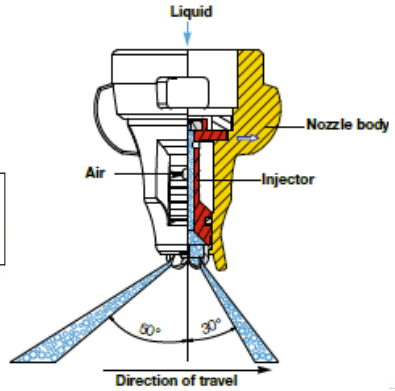


Guardian-Hypro 120 degree



Turbo Injection - TTI

Dva curka, vsak curek ima drugačen spekter kapljic – tako so pokrite različne potrebe – omočenje ciljne površine in prodiranje v sestoj.





Spray volume to the front is 60%, to the back 40% of total. This gives an optimal cross distribution even distance to the target may vary because of slopes or movement of the boom.

Droplet size at front jet is slightly smaller than back jet. The number of droplets in the spray is increased and so coverage is optimized. By this well balanced droplet spectrum the total coverage at vertical targets can be doubled compared to standard air induction flat fans.

Trend ukrivljanja škropilnega kota





Hitreje kot vozimo, bolj ukrivljen naj bo kot.





The ‘rugby ball’ effect of the old Defy nozzle (left) is eliminated with the new 3D version (right).

Defy Nozzle VP 03

Pre-em
use fwd and back
Post-em
fwd



Defy Nozzle VP 035

Pre-em
use fwd and back
Post-em
fwd



Defy Nozzle VP 04

Pre-em
use fwd and back
Post-em
fwd



Tip šobe je lahko pomemben tudi pri aplikaciji herbicidov pred vznikom (pod grude).

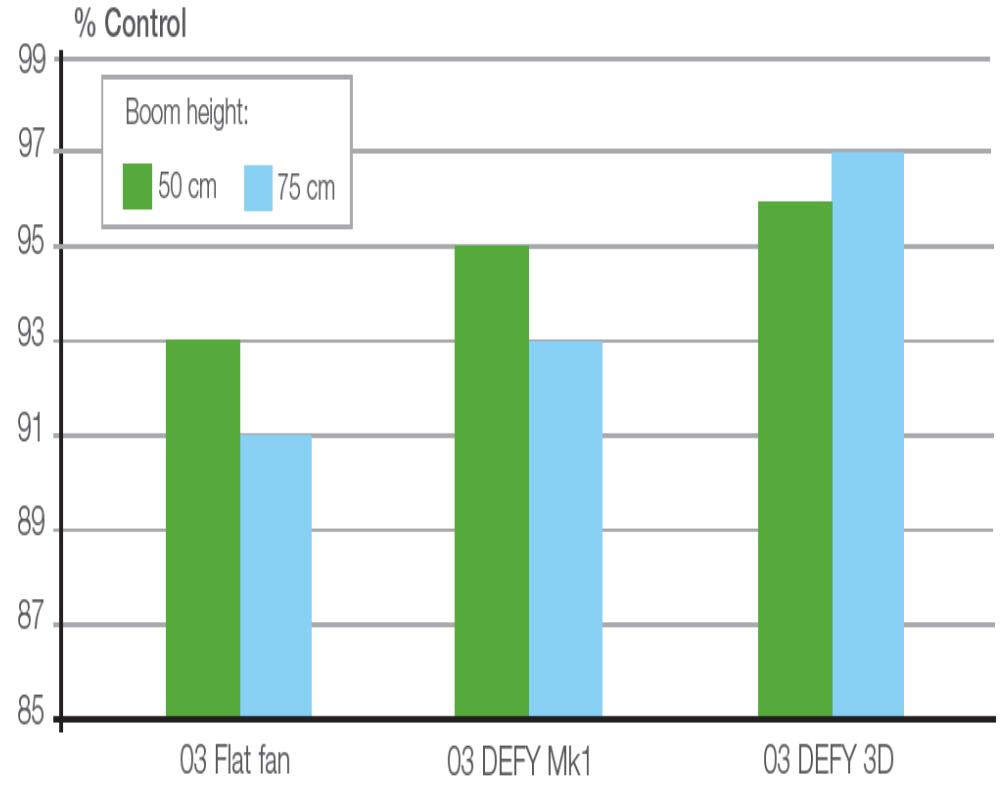
DEFY 3D

MAXIMISE YOUR PRE-EMERGENCE APPLICATIONS WITH THE NEW DEFY 3D NOZZLE



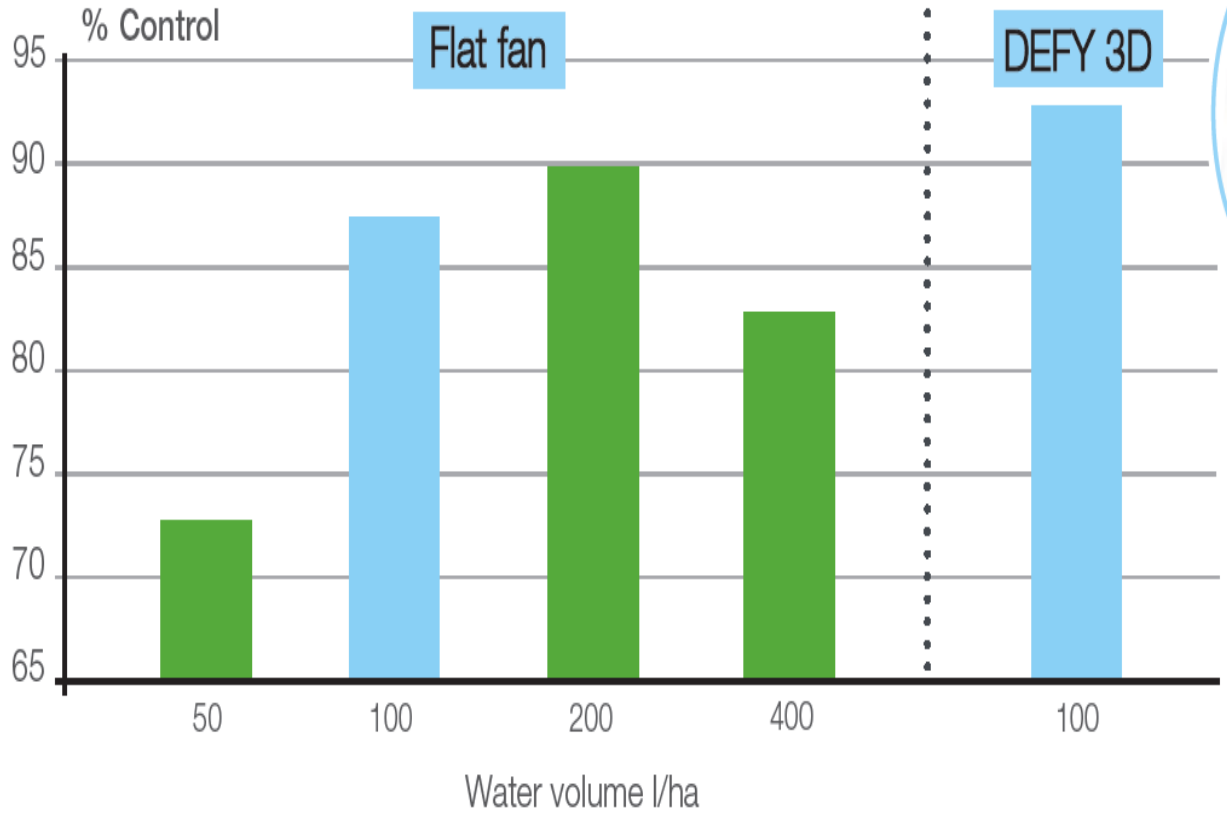
Zatiranje njivskega lisičjega repa

Improved black-grass control, even at 75cm boom height



Source: Syngenta application trials 2014. Pre-em applied 6th November: flufenacet/diflufenican + 4 l/ha DEFY

Reduce water volume without compromising weed control



Source: Syngenta application trials 2014. Pre-em applied 6th November: flufenacet/diflufenican + 4 l/ha DEFY

Pre-emergence flat spray nozzle PRE

Nozzle size
05

Spray angle
130°

Material
POM

Pressure range
1.5 – 8 bar

Recommended filters
25 M

Droplet size
Extreme coarse

Application areas

Herbicides pre-emerge

Liquid fertilizer

Golf course



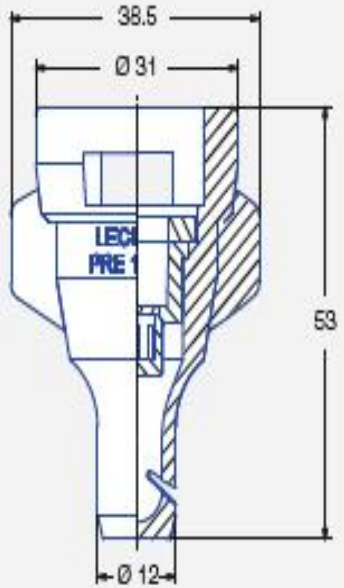
Extremely low-drift flat spray nozzle for timely application of pre-emergence herbicides.

Advantages

- 95 % drift reduction from 1.5 to 5 bar
- Flexible adaption to buffer zones
- Wide pressure range from 1.5 – 8 bar
- High workrate through simple adaptation of l/ha rate and driving speed
- Timely application even under adverse weather conditions

G 1981





Redukcija zanašanja in hkrati boljše apliciranje herbicidov z delovanjem proti travam (na primer v žitih proti srakopercu, ovsu in lisičjemu repu ali v okopavinah proti kostrebi in srakonji).
Problem pozne pre-em aplikacije v suhem vremenu in pri grudavem setvišču. Enako velja za zgodnji post v žitih.

Trendi v zadnjem času - šobe prilagojene za posamezne poljščine

Syngenta Nozzle Offers – 2015



AMISTAR
015, 02, 025, 03, 035, 04, 05

VEGETABLE
04, 06, 08

POTATO
04, 05

Application Guidelines

Vegetable Crops - Herbicides

Timing	Water Volume (L/ha)*	Best Nozzle	Reduced Drift Option	General Purpose	Notes
Pre-emergence good seed bed	100-200	DEFY nozzle alternating forwards and backwards	AMISTAR AI nozzle	110° Fan Jet	AMISTAR AI nozzle produces 40 drops/cm²
Pre-emergence cloddy seed bed	100-200	DEFY nozzle alternating forwards and backwards	AMISTAR AI nozzle	110° Fan Jet	Cloddy seed beds reduce weed control. Even coverage of clods both sides is achieved with angled nozzles
Post-emergence soil applied	200-400	06 or 08 Syngenta Vegetable nozzle	AMISTAR AI nozzle	110° Fan Jet	Narrow angle fan best for reducing spray retained on crop leaves
Gaminicide (grass weeds)	100-200	DEFY nozzle alternating forwards and backwards	AMISTAR AI nozzle	110° Fan Jet	Angled sprays typically double the spray retained on grass weeds
Broad leaved weeds	100-200	DEFY nozzle alternating forwards and backwards	AMISTAR AI nozzle	110° Fan Jet	

Amistar nozzle VP025

Original Amistar nozzle
3 bar optimum pressure
Air induction low drift
Fine drops, good coverage



Amistar Nozzle VP035

Go Faster' Nozzle
Increased workrates
3 bar optimum pressure
Low drift, good coverage



Vegetable Nozzle

Silver = 06 size
Force spray into crop
65° flat fan nozzle (not 110° ff)



Vegetable Nozzle

Gold = 08 size
Force spray into crop
65° flat fan nozzle (not 110° ff)



Syngenta Nozzle Range & Benefits

Trendi v zadnjem času

Nozzle Type	Specification	Spray Angle	Benefits
 AMISTAR AI Nozzle	VP110-025 VP110-03 VP110-035 VP110-04 VP110-05	10° backwards facing	• More droplets per litre than any other Air Induction nozzle • 10° spray angle increases deposition on front and back of target • Reduce spray drift by up to 75% • Variable Pressure (VP) nozzels. Hold spray pattern down to 1 bar • Made from wear resistant SuperPoly
 DEFY Nozzle	VP83-03 VP83-035 VP83-04	38° alternating forwards and backwards	• 38° spray angle increases deposition on hard to hit targets (ie. small grass weeds) • Provide up to 2 times the spray deposition of vertical nozzles • Can be angled forwards and back to maximize coverage of pre-emergent herbicides on soil clods • Designed to spray effectively at 70cm boom height, but can still be used down to 50cm • Reduce spray drift by up to 50% • Variable Pressure (VP) nozzels. Hold spray pattern down to 1 bar • Made from wear resistant SuperPoly
 Potato Nozzle	VP110-04 VP110-05	30° alternating forwards and backwards	• 30° spray angle improves coverage on lower leaves in complex canopies • Ideal where higher water volumes are required to improve coverage • Can be angled forwards and back for improved coverage, or all facing forward to reduce drift • Variable Pressure (VP) nozzels. Hold spray pattern down to 1 bar • Made from wear resistant SuperPoly
 Vegetable Nozzle	65-06 (Silver) 65-08 (Gold)	Vertical (65° fan)	• Designed to apply high water volumes and force spray into the crop • 65° fan angle slows down the droplet speed to improve deposition into the crown of target crops (carrots, brassica, lettuce) • Reduce herbicide contact on onions, reducing risk of crop damage

Hawk nozzle

VP 03



40° angle
2 - 2.5 bar optimum
Alt. Forward & back

Syngenta Potato Nozzle



Gold = VP 04
30° angle 3 bar opt.
Alt. Forward & back

Syngenta Potato Nozzle

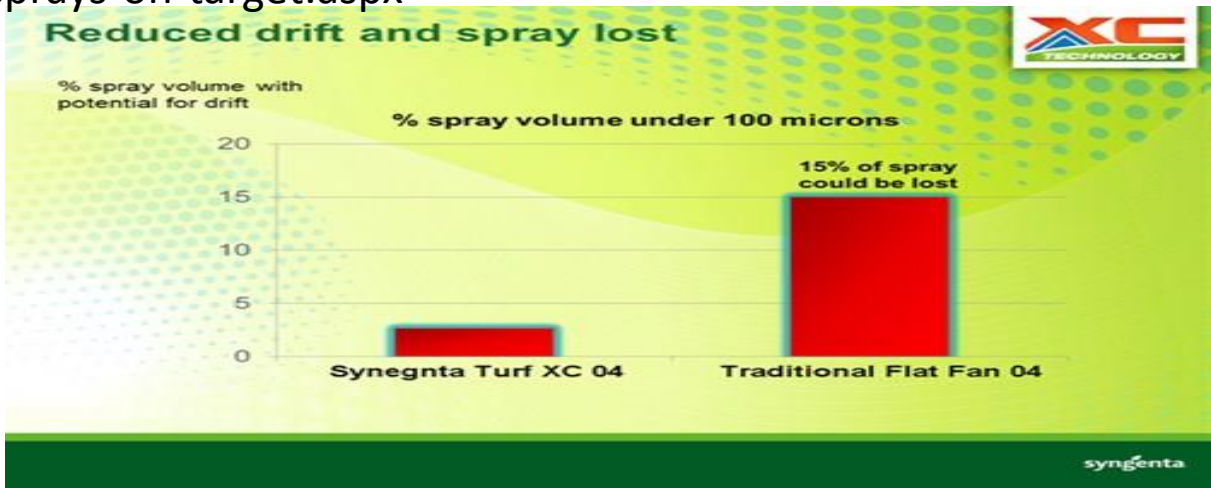
Orange = VP 05



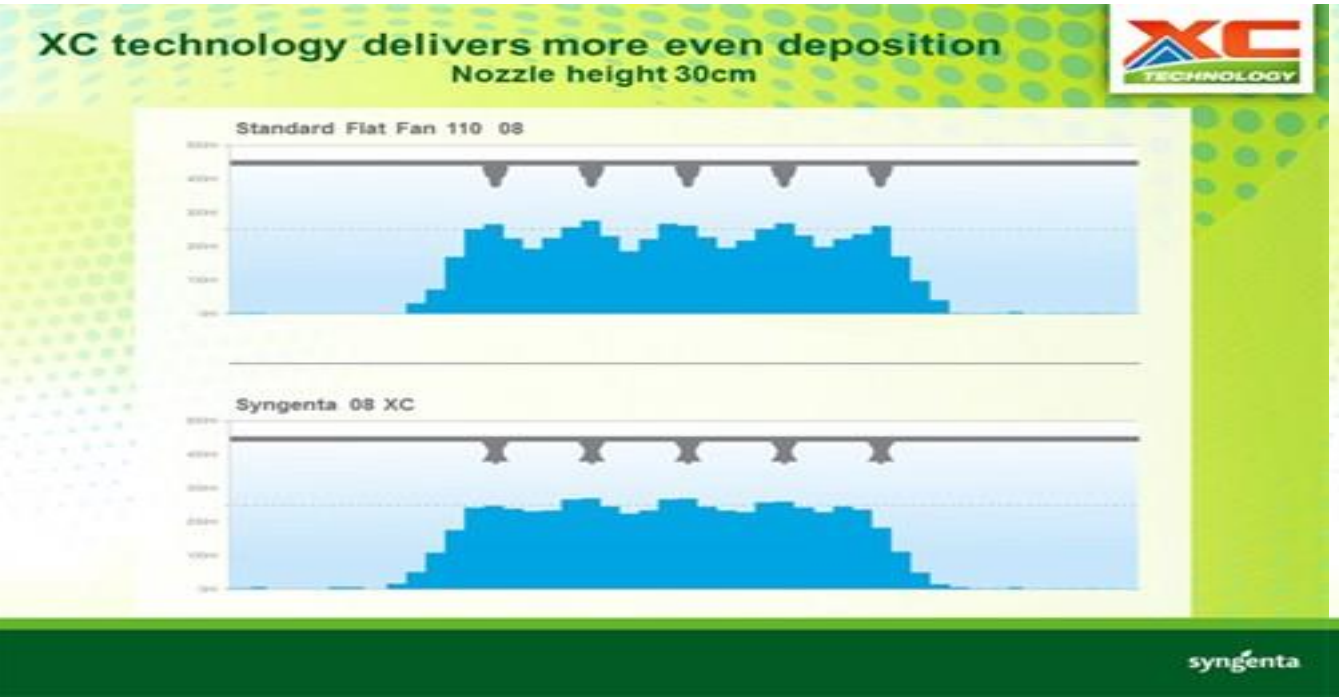
30° angle
3 bar optimum
Alt. Forward & back

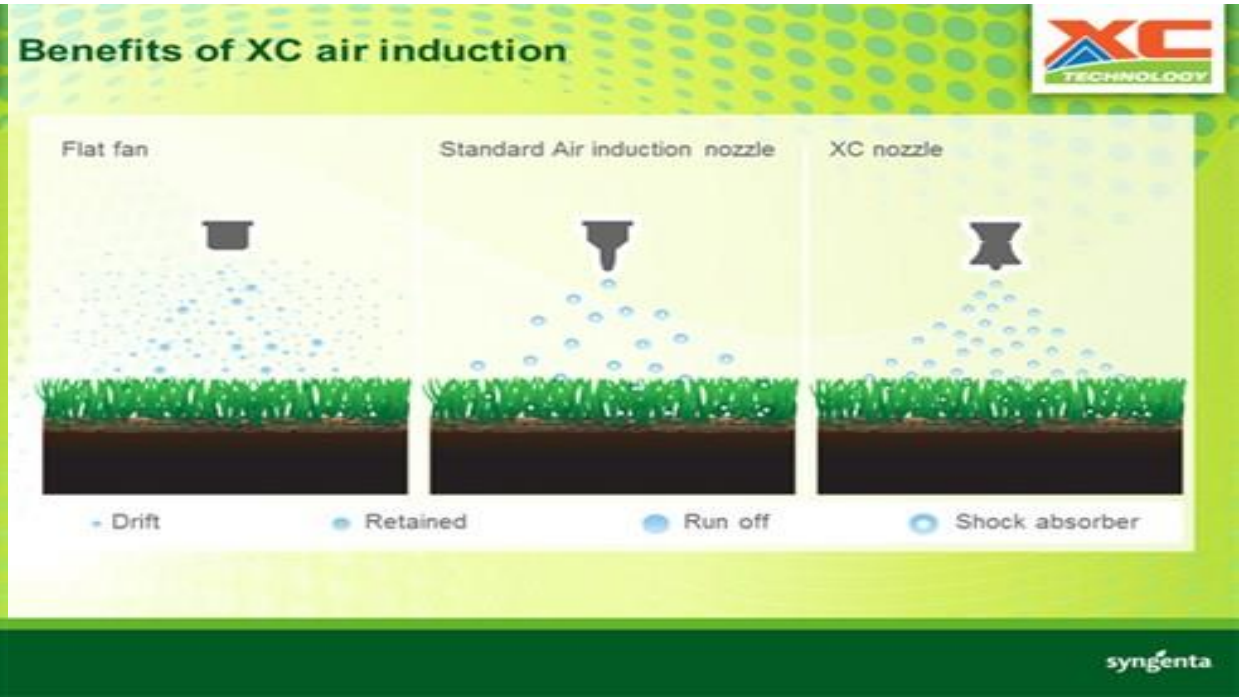
http://www.greencast.co.uk/uk/application-zone/xc-technology-gets-sprays-on-target.aspx

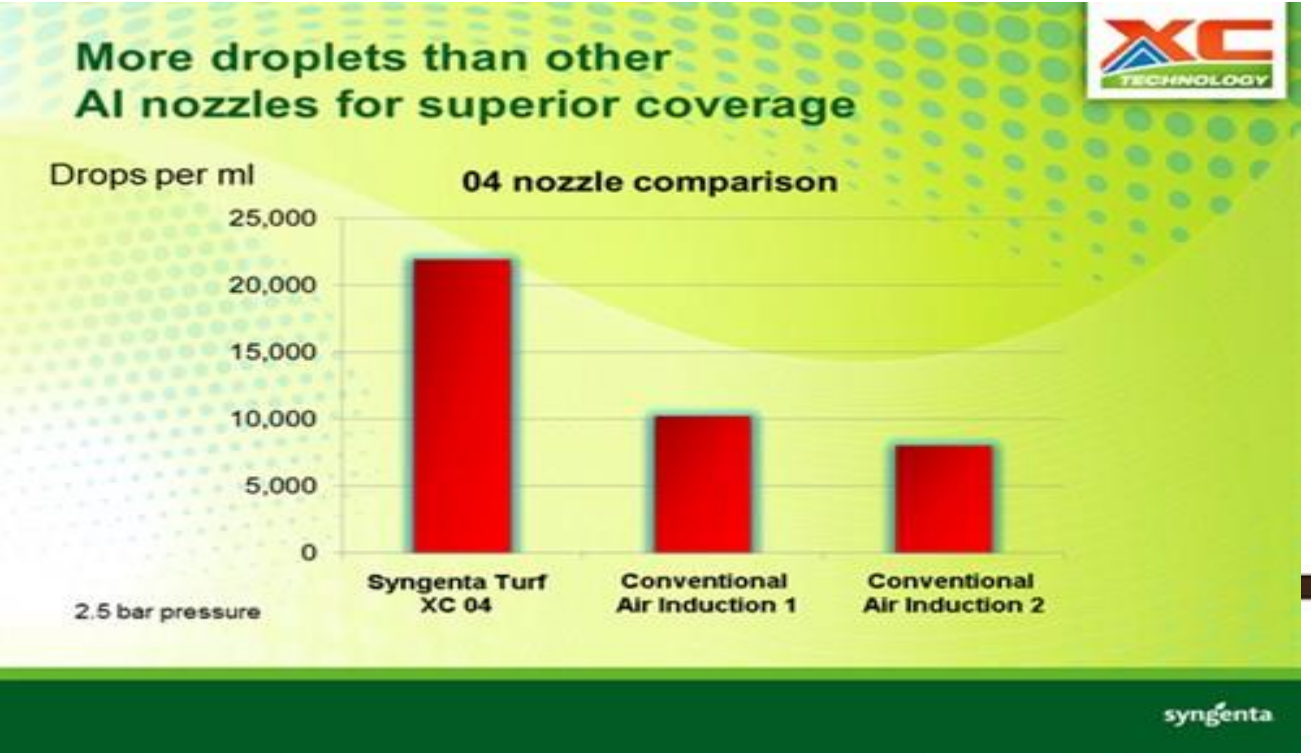


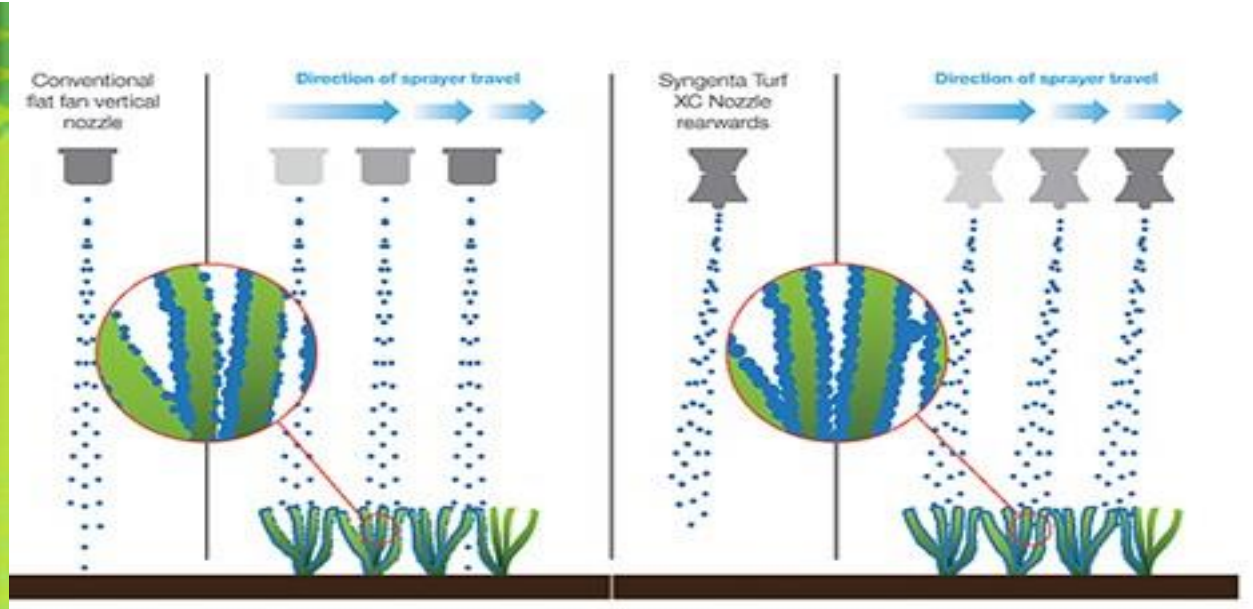


Trend zmanjševanja razdalje med šobami, razširjanje škropilnega polja ene šobe in povečevanja stopnje prekrivanja med šobami









Ukrivljanje kota zaradi gibanja in večja stopnja prekrivanja curkov zaradi več šob





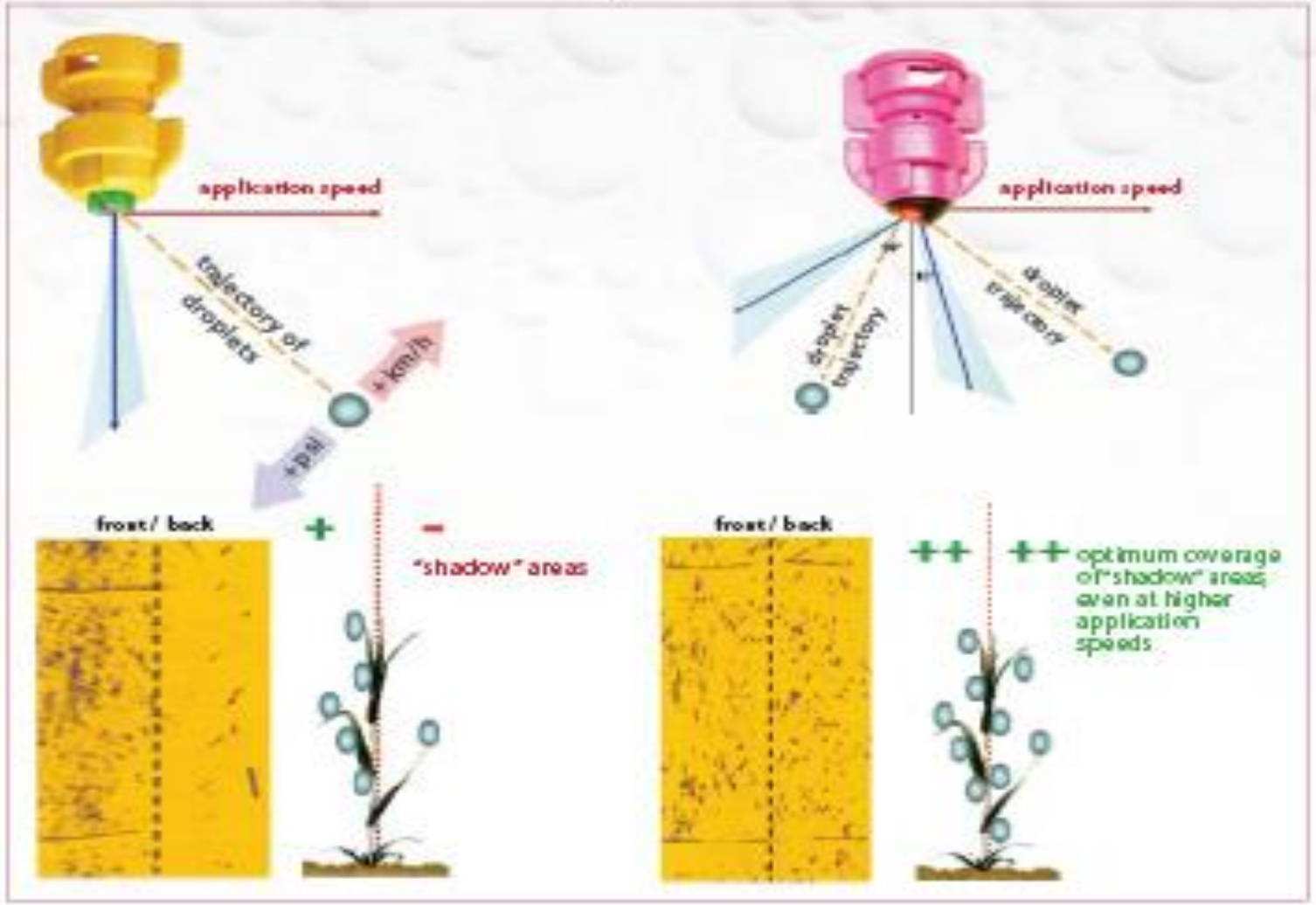
Trendi v zadnjem času – HI SPEED ŠOBE Z VEČ CURKI

For more information on application technology contact: **Jorg Kitt**, Application Specialist, **0429 939 404**



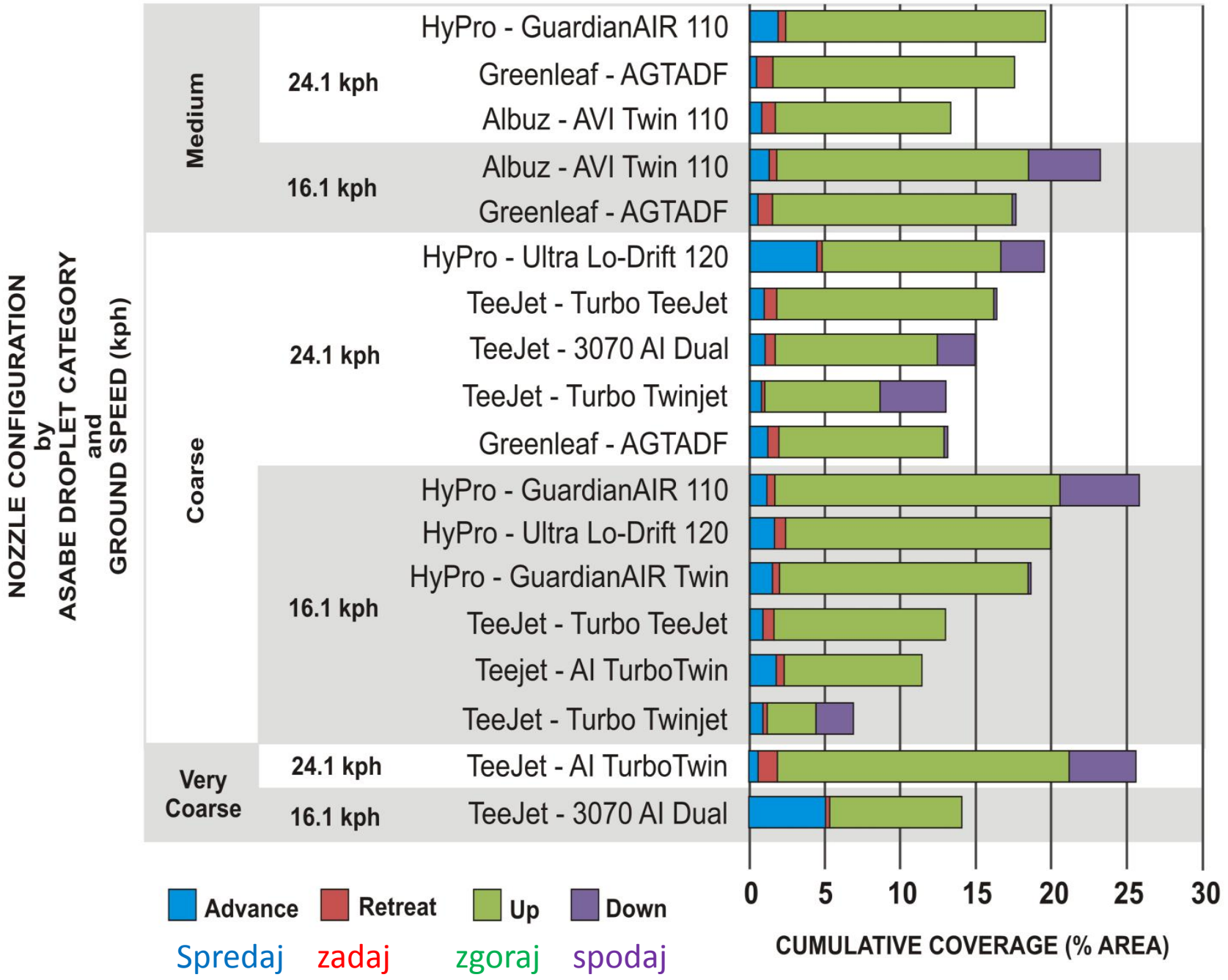
OPTIMA CROPLANDS

Turbodrop® - Image 1	Turbodrop® HiSpeed - Image 2



Sprayers101

Trendi v zadnjem času – povečevanje hitrosti vožnje

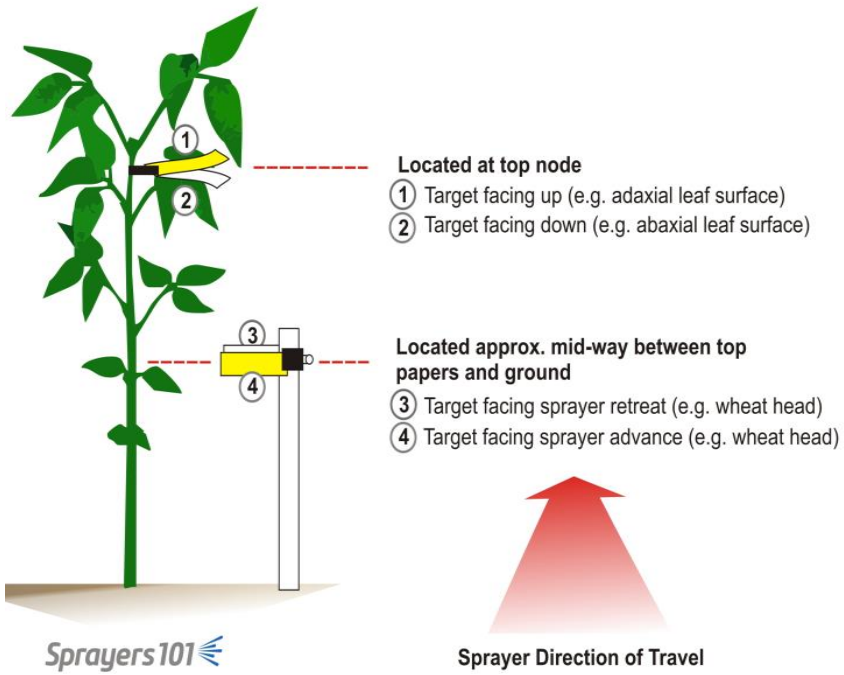


Oblikovanje depozita škropilne brozge v soji v odvisnosti od tipa šobe, velikosti kapljic in hitrosti vožnje. Soja je kot dlakav plevel.

Antidriftne šobe niso imele slabših karakteristik od standardnih šob.

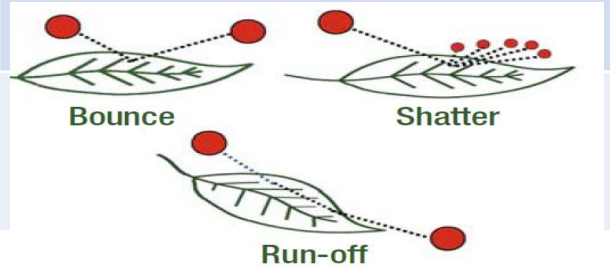
Twin šobe značilno izboljšajo depozit. Če izberemo antidriftne šobe izberemo twin tip.

Injektorske šobe so uporabne pri velikih hitrostih vožnje.



DEJAVNIKI KI VPLIVAJO NA ODLOČITVE GLEDE KOMBINACIJE TIP ŠOBE, VELIKOST KAPLJIC, PORABE VODE, TIP DODATKA

Gojena rastlina	Plevel	Herbicid	Vreme
Razvojni stadij	Razvojni stadij	kontaktni / sistemik	Vetrovno da / ne
Sortna občutljivost	Gostota in razmerja velikosti (»dežnik eff«)	Hormonec / triazini / Sulfonilsečnina	Visoka ali nizka zračna vlaga
Rastline mokre ali suhe	Rastline mokre ali suhe	Triketoni / Triazolinoni	Vroče ali hladno
Zdravstveno stanje	Enoletni / večletni	Imidizolinoni / bipiridili / difenil etri	Padavine v naslednjih urah ali dneh (formiranje rose)
Stopnja prehranjenosti	Ozkolistni / širokolistni	Vrste herbicidov, ki jih mešamo	Obsežne padavine pred kratkim
Rastlina v stresu da/ne	Rastlina v stresu da/ne	Kakovost tovarniške formulacije	Dan / noč
Čas do spravila	Veliko plevelov močno poraščenih z dlačicami	Trdota in temperatura vode	Visok / nizek UV
	Veliko plevelov z voščeno prevleko	pH območje	



Ansprüche von Herbiziden bei Frühjahrsanwendung

PRI HERBICIDIH MORAMO POZNATI NJIHOVE APLIKACIJSKE ZAHTEVE IN OMEJITVE – PRIMER IZ NEMČIJE

Herbizid	HRAC Klasse	Optimaler Spritztermin A.fuchsschw. (Windhalm)	% Wirkung über		zur/nach Behandlung Anspruch an				vorange-gangenes Hochdruck-wetter	empfohlene Zusätze	regen-fest ..... Stunden nach Applikation
			Wurzel	Blatt	Boden-feuchte	Tempe-ratur	Benet-zung	Luft-feuchte			
			ca.	ca.			Blatt				
Axial 50	A	13 - 25	0	100	keine	> 2°C	wichtig	> 40 %			2
Traxos	A	13 - 25	0	100	keine	> 6°C	wichtig	> 40 %			2
Topic 100	A	13 - 25	0	100	keine	> 10°C	wichtig	> 40 %		Netzmittel	3
Ralon S.	A	13 - 25	0	100	keine	> 1°C	wichtig	> 40 %		Netzmittel	3
Atlantis WG + FHS	B	13 - 25	20	80	gering	> 8°C	mittel	> 60 %	ungünstig		6
Atlantis OD	B	13 - 25	20	80	gering	> 8°C	mittel	> 60 %	ungünstig		4
Boradway + FHS	B	13 - 25	5	95	gering	> 10°C	mittel	> 60 %	ungünstig		1
Attribut, Caliban Duo	B	09 - 13	60	40	mittel-feucht	> 5°C	gering	> 60 %	ungünstig	AHL/Netzmittel	2
Lexus, Absolute M, Ciral	B	09 - 13	50	50	mittel-feucht	> 5°C	mittel	> 60 %	ungünstig	AHL/Netzmittel	2
Monitor	B	12 - 21	30	70	mittel	> 10°C	mittel	> 60 %	ungünstig	AHL/Netzmittel	2
Husar OD	B	12 - 21	20	80	mittel-gering	> 10°C	mittel	> 60 %	ungünstig		2
Concert SX	B	12 - 21	30	70	mittel-gering	> 5°C	mittel	> 60 %	ungünstig	AHL/Netzmittel	2
IPU, Herbaflex	C	12 - 13	50	50	feucht	> 8°C	gering	> 40 %		AHL/Netzmittel	4
										AHL/Netzmit	

Prehajanje herbicida skozi listno površino – različne poti za polarne ali nepolarne molekule aktivnih snovi

Figure 1. Diffusion of herbicide from leaf surface.



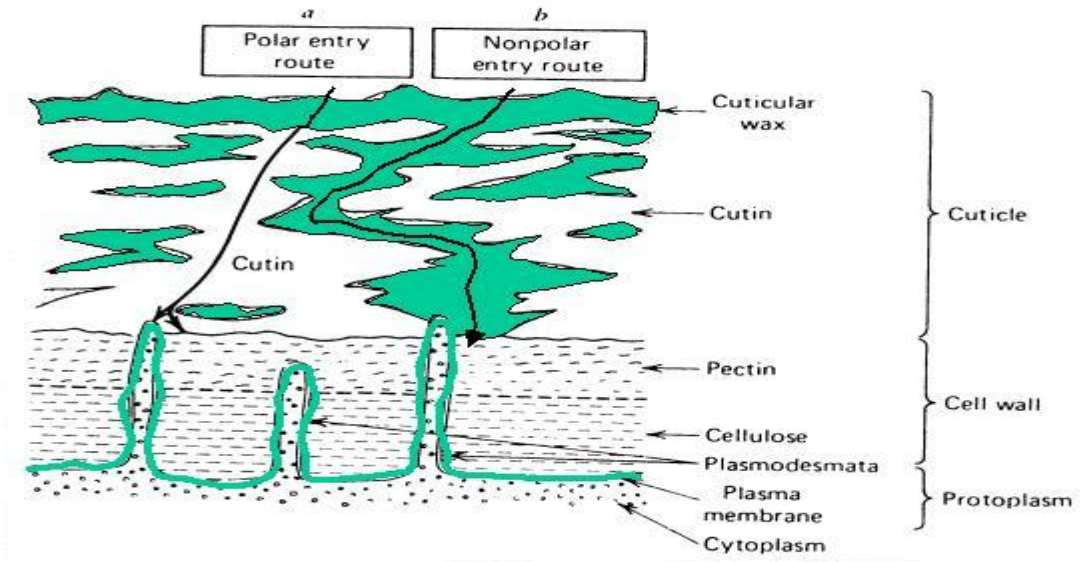


Herbicid, ki vsebuje dve a.s. z različno polarnostjo.

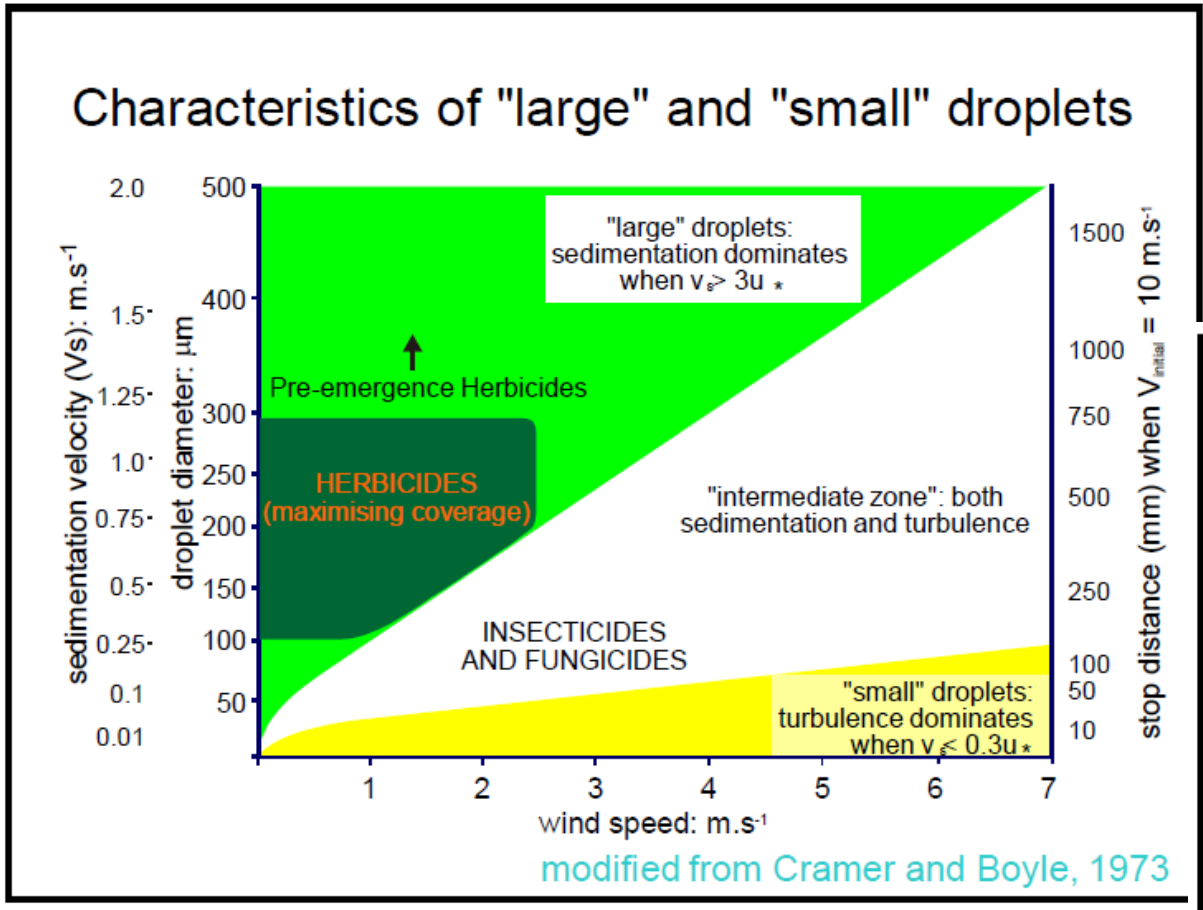
PRIMER POLARNI HERBICIDI – HIDROFILNI (nižji **Log K_{ow}**
Nikosulfuron, tribenuron, parakvat, dikvat, glifosat, 2,4-D, bentazon, triklorpir, setoksidim, mekoprop-p, diklorprop-p, glufosinat, …
Vmesno (nad 1) – številne sulfonilsečnine, triasulfuron, kloridazon, metosulam, MCPA

PRIMER NEPOLARNI HERBICIDI – LIPOFILNI (višji **Log K_{ow}**
Fluazifop-p-butil, oksifluofen, tralkoksidim, kvizalofop, karfentrazon, rimsulfuron, fenmedifam, desmedifam, fluroksipir, napropamid, flukloridon, klorotoluron, trifluralin, pendimetalin, piridat,
oksadiazon, … (pogojno atrazin, cianazin in simazin)

Figure 2. Absorption routes from leaf surface to cytoplasm. (Ashton and Crafts. 1981.)



Green areas represent lipophilic regions: epicuticular wax, cell membrane (plasma membrane).

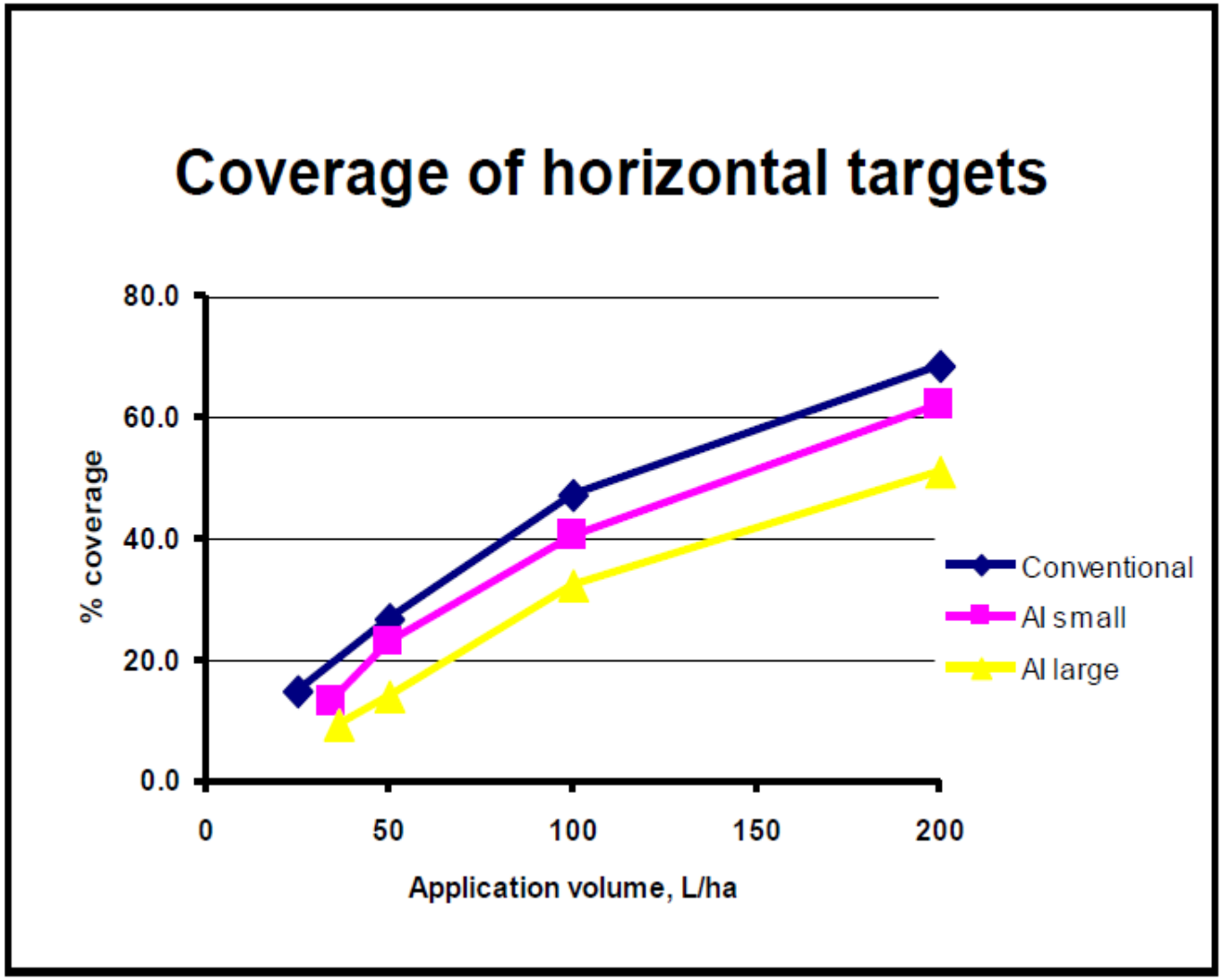


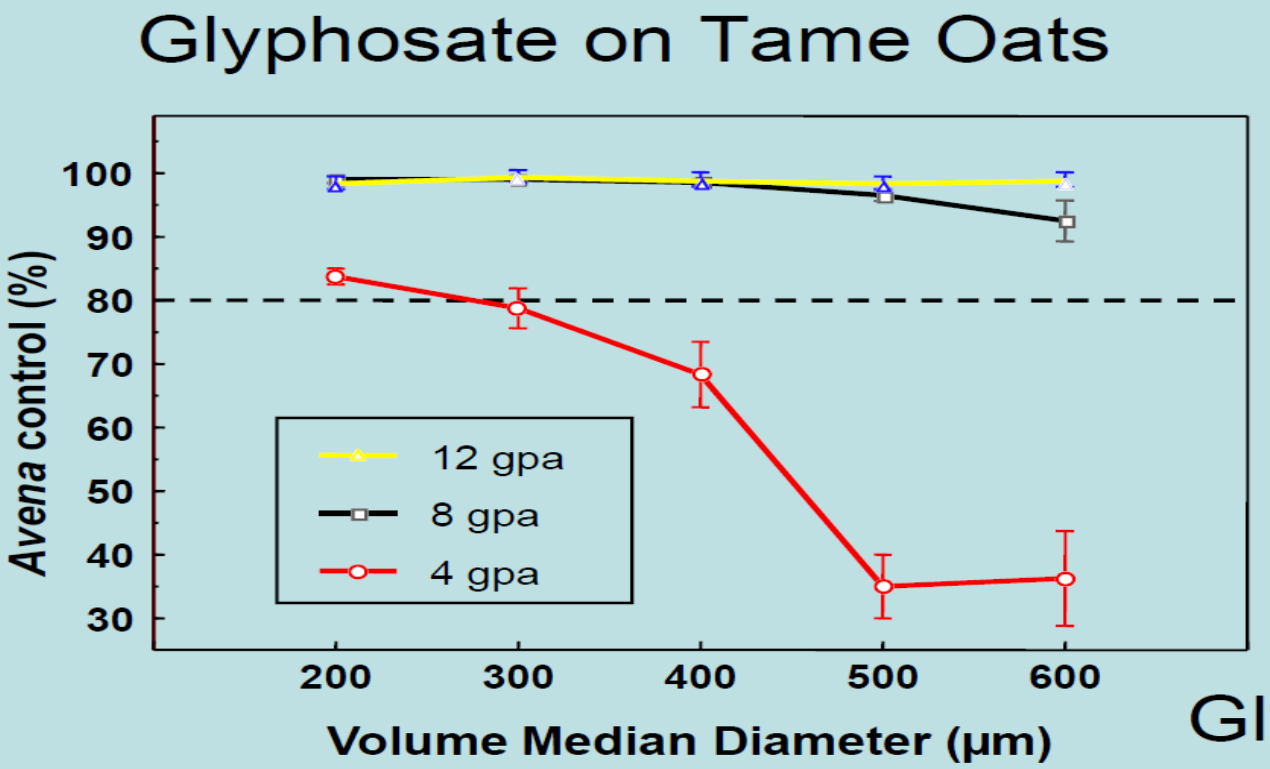
http://www.dropdata.org/download/

ZA POTREBE APLIKACIJE HERBICIDOV LAHKO IMAMO VEČJE KAPLJICE KOT ZA APLIKACIJO FUNGICIDOV IN INSEKTICIDOV - manjše izhodiščno tveganje za drift.

NA SPLOŠNO BI SE NAJ POKRITOST CILJNE POVRŠINE S ŠKROPILNO OBLOGO S POVEČEVANJEM KAPLJIC ZMANJŠALA

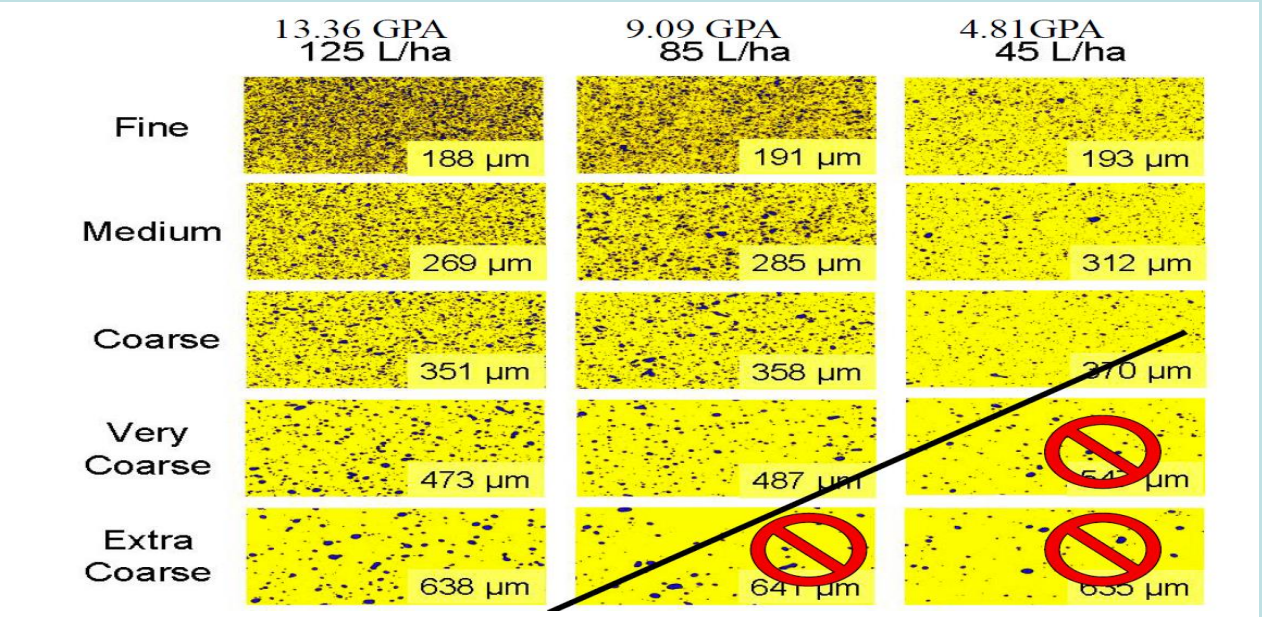
- TO DRŽI ZA VERTIKALNE POVRŠINE (predvsem trave)
- ZA HORIZONTALNE POVRŠINE TO NE DRŽI VEDNO
- Pri zelo gostih sestojih se lahko celo poveča

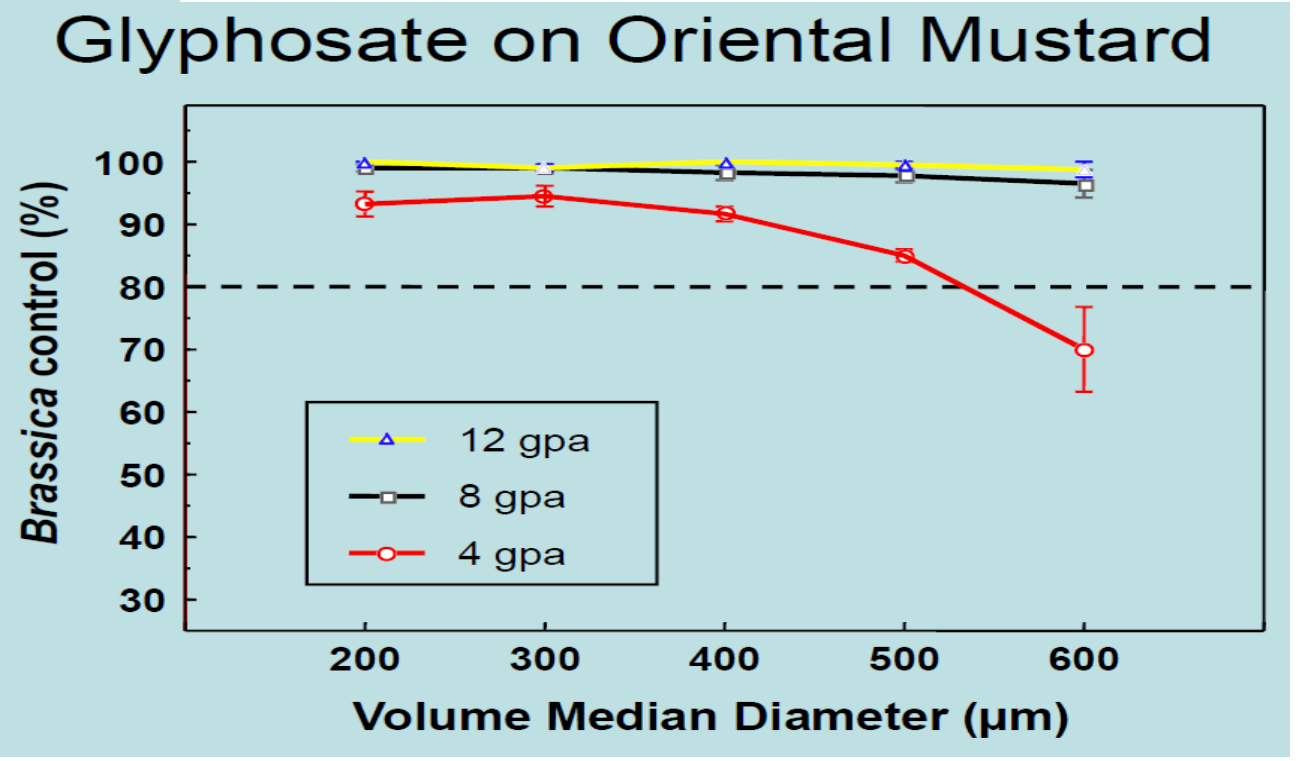




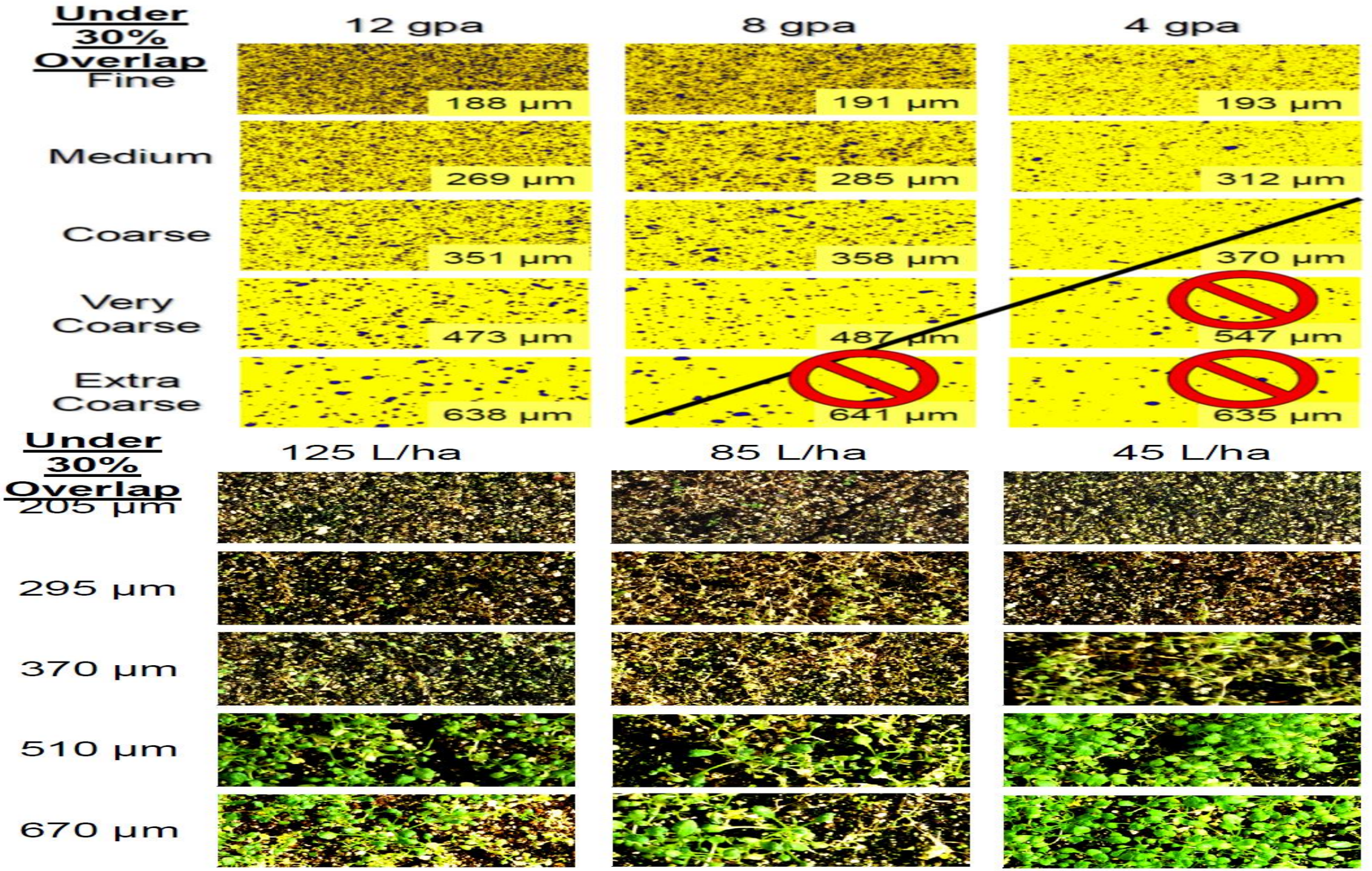
Negativen učinek povečevanja kapljic je na učinkovitost herbicida pri sistemičnih pripravkih pri travah večji, kot pri širokolistnih plevelih in se povečuje z zmanjševanjem količine vode na ha.

Primer delovanje herbicida glifost na divji oves (Avena) in samosevno gorjušico (Brassica) glede na interakcijo velikost kapljic in količina vode.





Nikoli ne škropimo na način, da izberemo kombinacijo male porabe vode in zelo velikih kapljic. Število zadetkov je premajhno in poslabša se stopnja prekrivanja med šobami. Primer delovanja herbicida glifosat na gorjušico.



Zatiranje trav – različni graminicidi – različne velikosti kapljic

Field and laboratory trials were conducted near Saskatoon in 2003, 2004, and 2005. Simulated grassy of broadleaf weeds were treated with Horizon (clodinafop-propargyl), Assure II (quizalofop), Puma (fenoxaprop-p-ethyl), and Everest (flucarbazone-sodium). Spray application was done with three nozzles, offering three spray qualities: TeeJet DG11003 (ASAE Medium), Delavan RF 11003 (ASAE Coarse) and Delavan RF11003 with RF11004 exit tip (ASAE Very Coarse) (Table 1).

Table 1: Treatment list for field trials

Nozzle Type	Volume (L/ha)	Capstan Duty Cycle (%)	Pressure (psi)	VMD[1] (µm)	Spray Quality
DG 11003	45	25	32	295	Medium
	85	60	36		
	125	100	36		
RF 11003	45	25	42	370	Coarse
	85	60	36		
	125	100	39		
RF 11003/04	45	25	38	510	Very Coarse
	85	60	41		
	125	100	40		

[1] Volume Median Diameter

Assure II Kvizalofop (lipofilno počasna mobilnost)

Assure II was more sensitive to droplet size than Horizon. While oat control was very good at the full label rate and Medium to Coarse sprays for all water volumes, control was significantly reduced when when spray quality became Very Coarse at all water volumes. This effect was most pronounced at the lowest water volume.

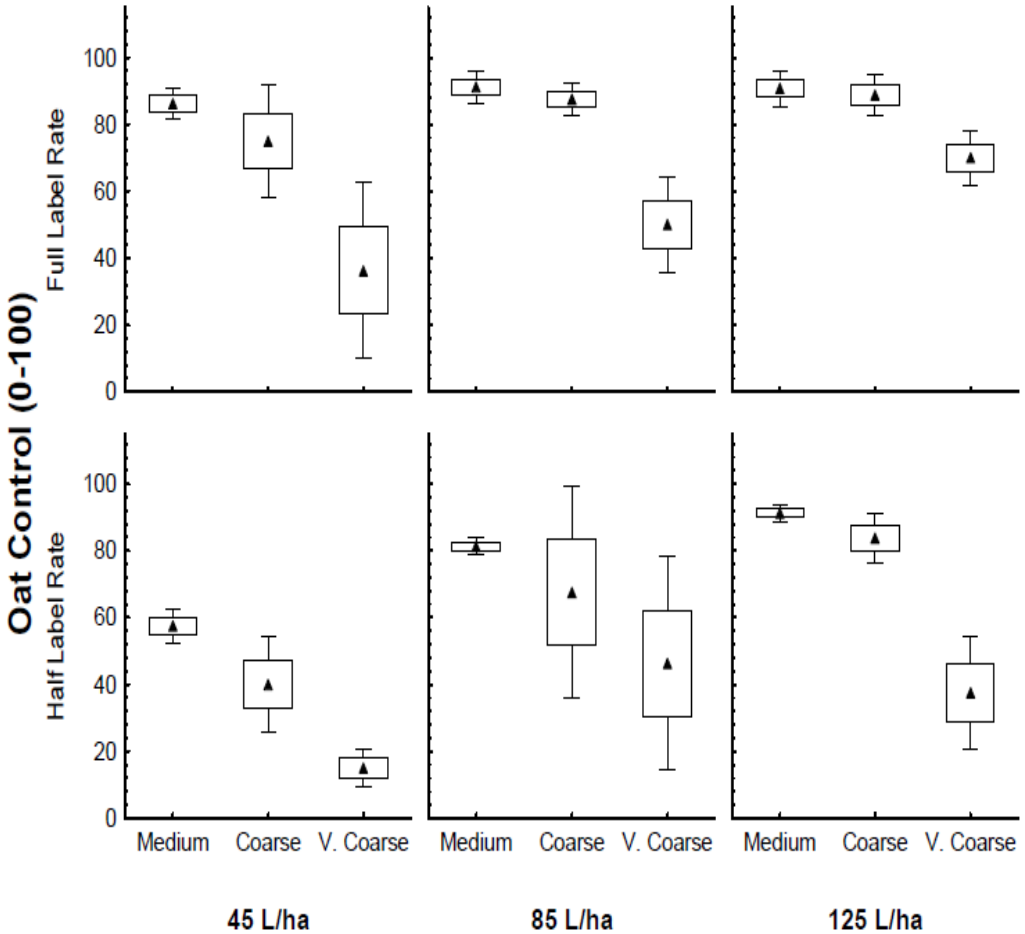


Figure 2: Interactive effect of water volume and droplet size on Assure II oat control (2005).

Puma Super

FENOKSAPROF-P-ETIL (počasno gibanje po rastlini)

EVEREST FLUKARBAZON (hitrejše gibanje)

OBČUTNA RAZLIKA V UČINKU glede na velikost kapljic MED DVEMA RAZLIČNIMA AKTIVNIMA SNOVEMA

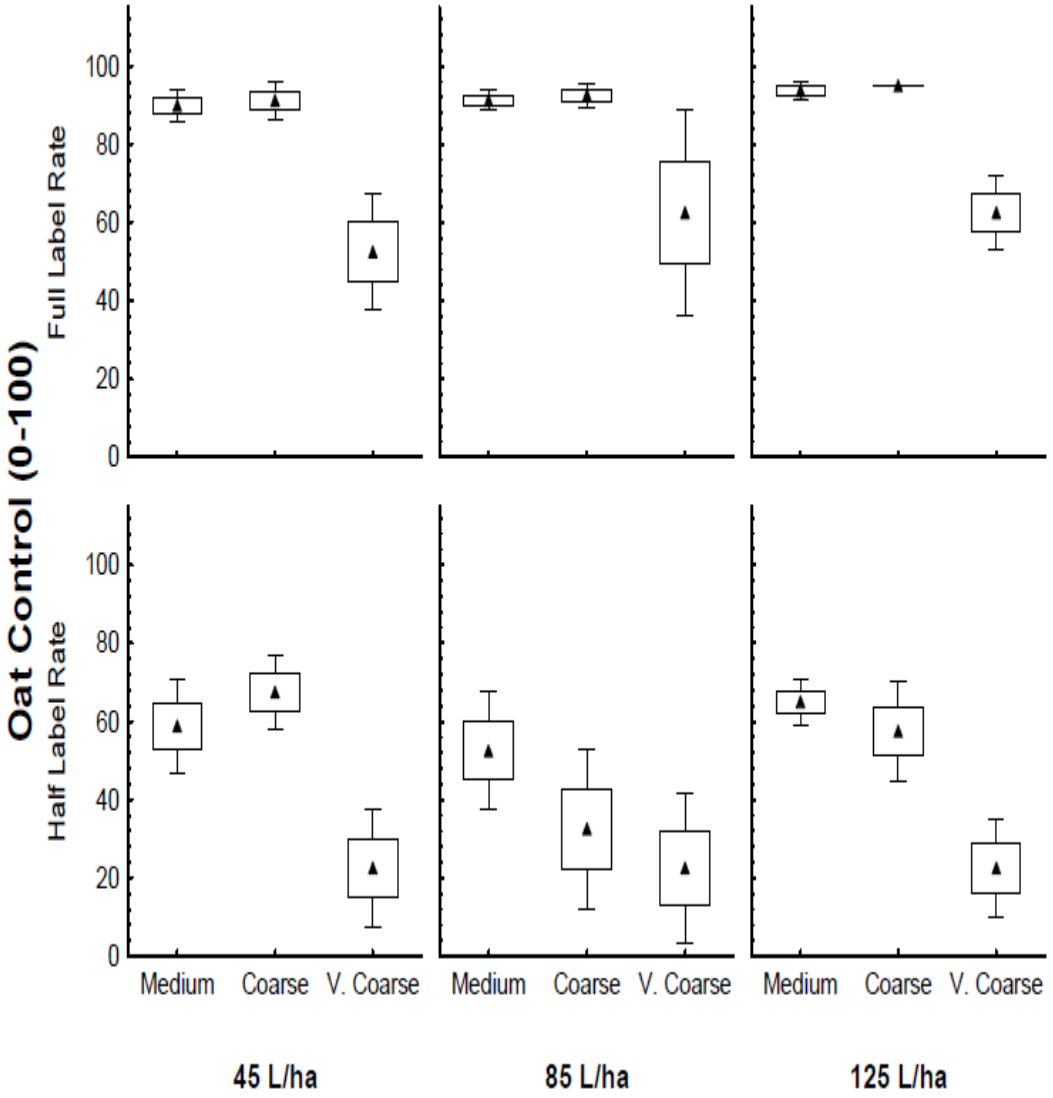


Figure 3: Interactive effect of water volume and droplet size on Puma Super oat control (2005).

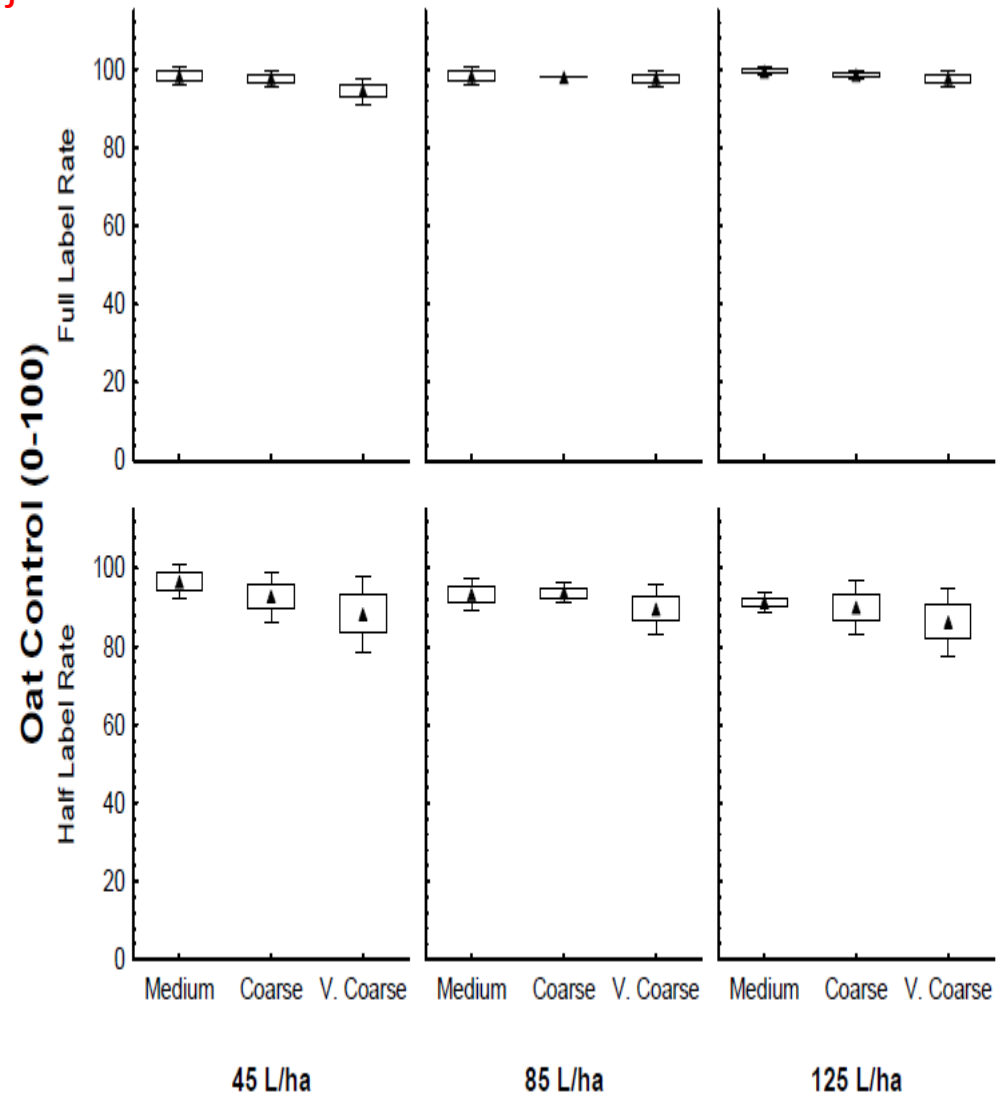


Figure 4: Interactive effect of water volume and droplet size on Everest oat control (2005).

DELEŽ KAPLJIC (DEPOSITION EFFICACY), KI SE OBDRŽI NA LISTU GLEDE NA VELIKOST KAPLJIC – RAZLIKA MED PLEVELI

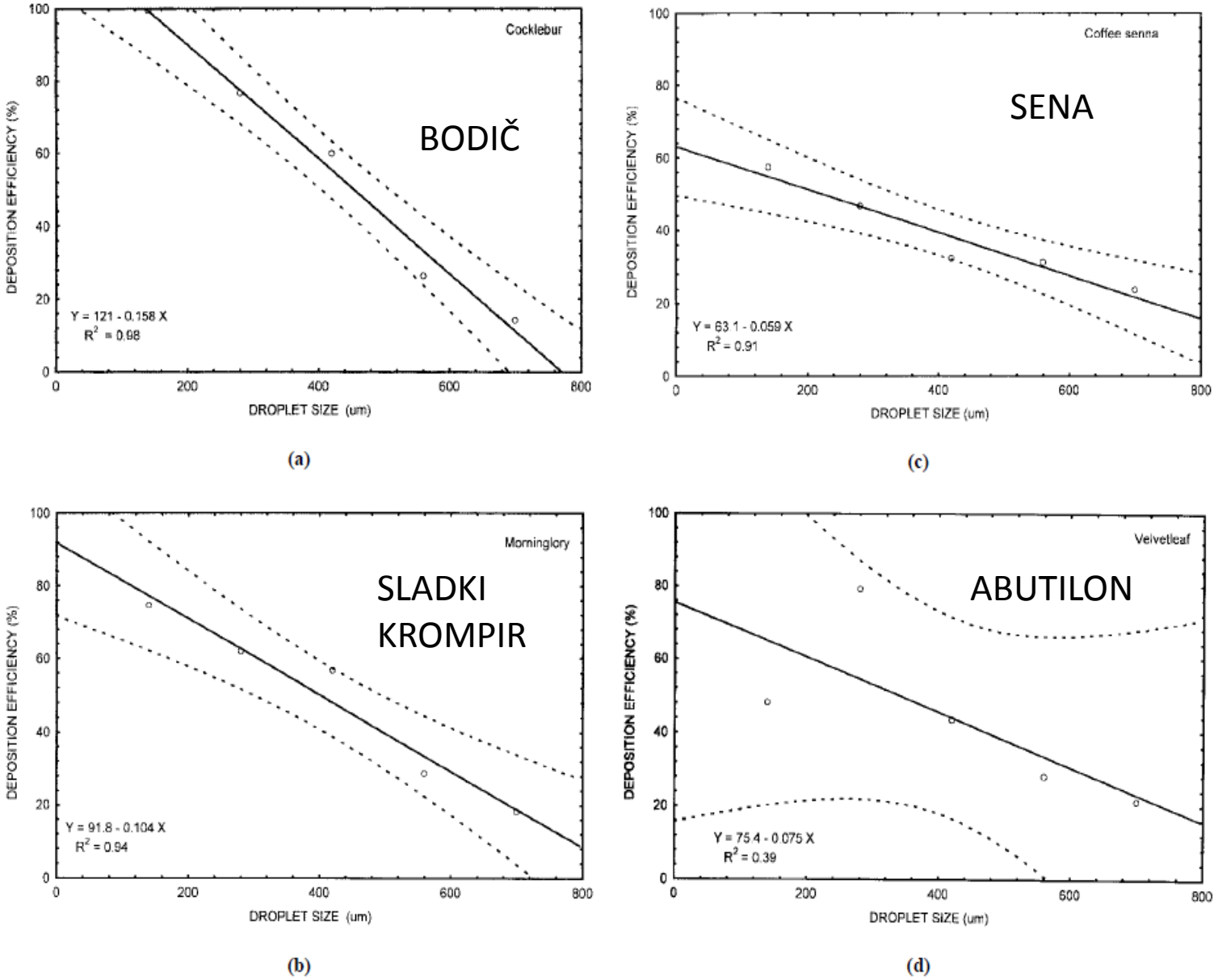


Figure 2–Effect of discretely-sized droplets on spray deposition for each of four weed leaf types. Linear regression lines with confidence limits indicated.

DROPLET SIZE AND LEAF MORPHOLOGY EFFECTS ON PESTICIDE SPRAY DEPOSITION

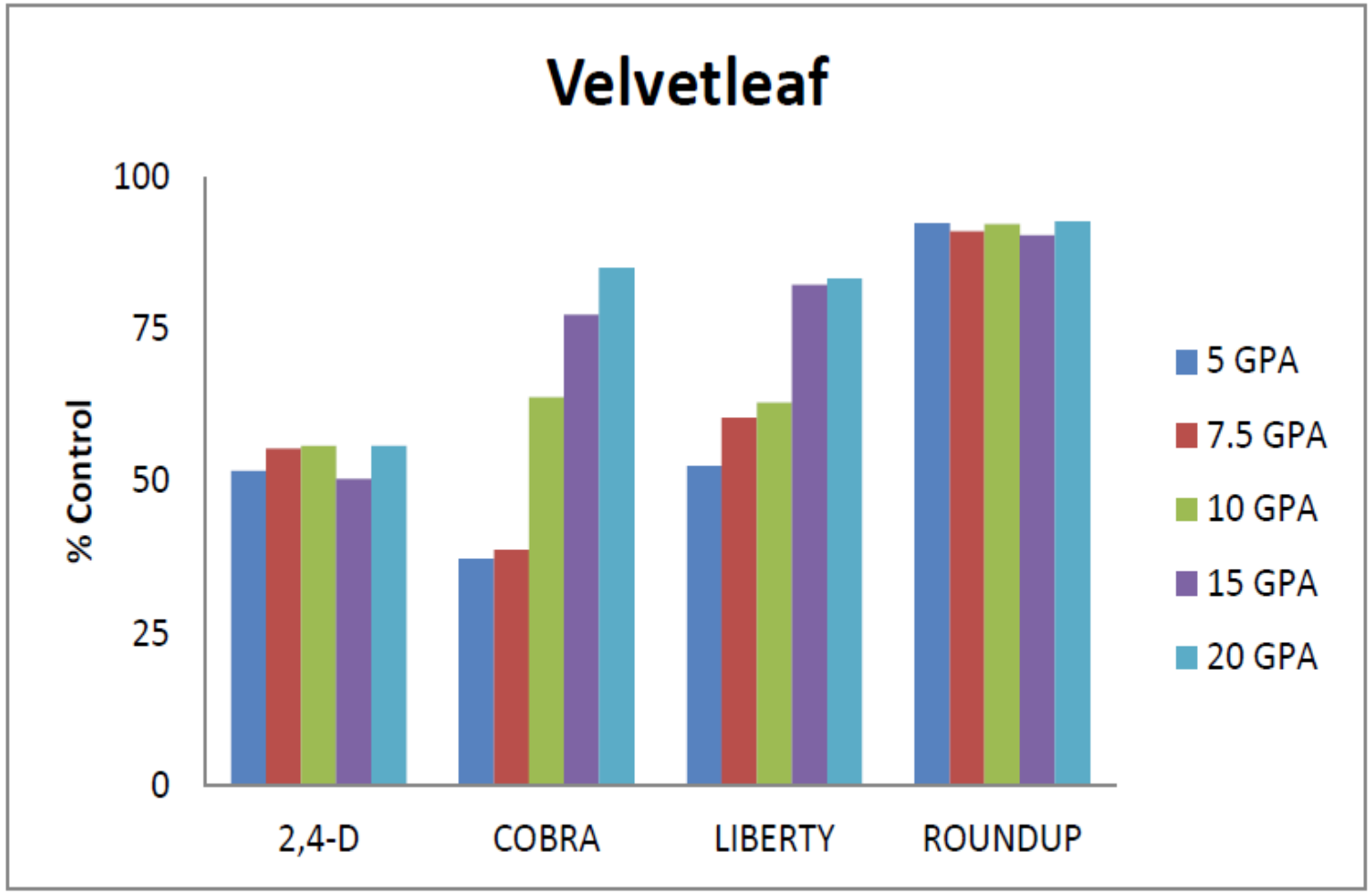
D. B. Smith, S. D. Askew, W. H. Morris, D. R. Shaw, M. Boyette

Z VEČANJEM KAPLJIC SE ZMANJŠA DELEŽ TEKOČINE, KI OSTANE NA POVRŠINI RASTLINE

VELIK VPLIV IMA ORIETACIJA LISTOV, VOŠČENOST IN OBLIKA DLAČIC

Bodič (Xanthium) je bistveno lažje omočiti, kot na primer metuljnico seno (Senna)

Učinki povečevanja vode za škropljenje pri različnih herbicidih so različni:



laktofen glufosinat glifosat

Figure 4. Visual ratings of 2,4-D, Cobra, Liberty and Roundup PowerMax injury on a velvetleaf at 5, 7.5, 10, 15, and 20 GPA.

Približno 50, 75, 100 150 200 l/ha

Primer učinka količine vode na hektar na učinkovitost herbicidov za zatiranje baržunastega osleza pri različnih herbicidih:

SISTEMIČNO
Pri 2,4-D količina vode ni bila pomembna

Tudi pri glifosatu količina vode ni bila pomembna

KONTAKTNO – polsistemično

Pri laktofenu in glufosinatu je količina vode vplivala na učinkovitost

Nasveti glede izbire šob - v tujini ločijo med majhnimi pleveli in višjimi stadiji plevelov

Nozzle selection

for conventional boom sprayers treating cereals and oilseed rape

Nozzle type	Air induction		Conventional			Low drift (pre-orifice)					
	Flat fan		Flat fan			Hollow cone		Flat fan		Deflector	
Likely spray quality	Small droplet	Large droplet	Fine	Medium	Coarse	Fine	Medium	Medium	Coarse	Medium	Coarse
Soil-acting herbicides											
Pre- and early post-emergence	▲	▲✱		▲	▲			▲	▲	▲	▲
Foliage-acting herbicides											
Grass weeds – 3 leaves or less			▲▲	▲✱			▲				
Grass weeds – more than 3 leaves	▲✱		▲	▲▲				▲		▲	
Broad-leaved weeds – up to 2cm across			▲▲	▲▲✱							
Broad-leaved weeds – 2–5cm across	▲✱		▲	▲▲			▲			▲	
Broad-leaved weeds – more than 5cm	▲▲✱			▲▲			▲	▲		▲	
Non-selective (eg glyphosate)	▲▲	▲✱		▲▲	▲			▲▲	▲	▲	▲

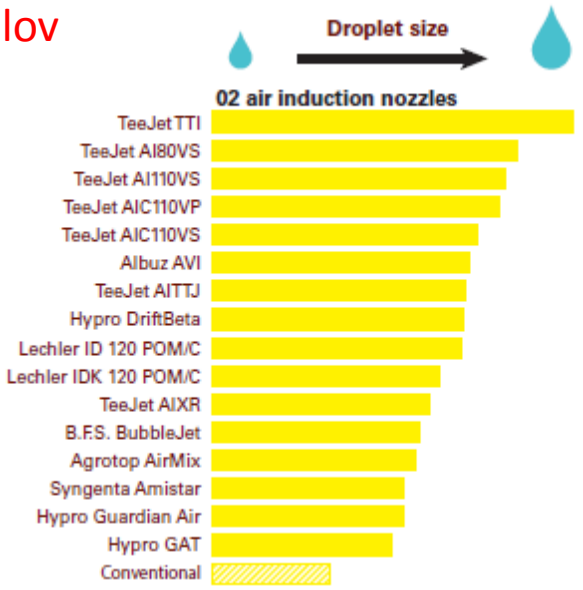
Key

▲ = nozzles offering acceptable efficacy

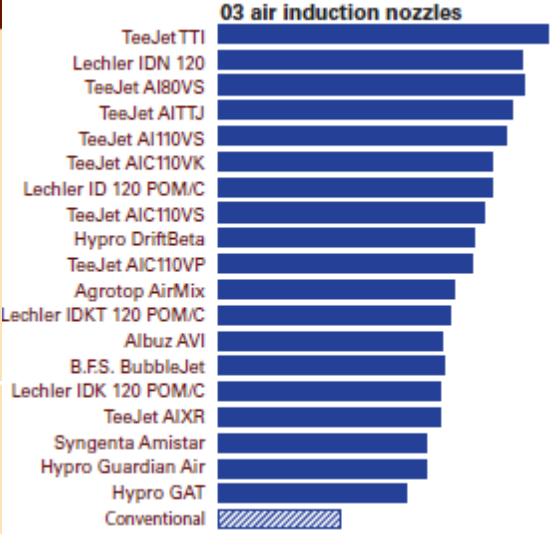
▲▲ = preferred nozzles for efficacy

✱ = nozzles offering best drift control

Nozzle selections indicated are based on spray volumes of 100-200 l/ha and forward speeds of 8–16km/h and using a typical range of pressures for each nozzle design. Generally, higher spray pressures give a smaller droplet size distribution therefore, a finer spray; wider spray angles give a finer spray.



Med šobami istega pretočnega razreda pri različnih proizvajalcih so velike razlike glede VMD



HYPRO® NOZZLES

Best for efficacy | Acceptable efficacy | Urgent spraying only | Not suitable

Ponekod povezujejo izbor šobe z doseganjem prednostnega cilja aplikacije CHALLENGE

NOZZLE SELECTION GUIDEL

Application guidelines are given for 3 bar pressure, 10-16 kph. At these pressures finer air induction nozzles such as GuardianAIR™ Twin typically reduce drift by 50%, whilst coarser air induction nozzles such as DriftBETA and ULD typically reduce drift by over 75%.

	CROP STAGE AND CHEMICAL TYPE:	TARGET:	APPLICATION CHALLENGE:	FLAT FAN		AIR INDUCTION		
				MEDIUM		FINER		COARSER
				 VP	 VPTECH™ 30° INCLINE	 GUARDIAN AIR™ 12-15° INCLINE	 GUARDIAN AIR™ TWIN 30° INCLINE	 ULD / DRIFT BETA
AUTUMN	SOIL-ACTING PRE OR EARLY POST-EM HERBICIDES	SOIL	EVEN COVERAGE OF SOIL CLODS					
	INSECTICIDES	SMALL OSR OR CEREAL PLANTS	SMALL TARGET AREA TO WET					
	POST-EM SELECTIVE HERBICIDES	SMALL GRASSES (LESS THAN 3 LEAVES)	SMALL TARGET AREA, WEED SHADING					
SPRING	POST-EM SELECTIVE HERBICIDES	GRASSES (MORE THAN 3 LEAVES)	VERTICAL TARGET ORIENTATION					
	POST-EM SELECTIVE HERBICIDES	BROAD-LEAVED WEEDS (UP TO 2 CM ACROSS)	SMALL TARGET AREA, CONSIDER WEED SHADING					
	POST-EM SELECTIVE HERBICIDES	BROAD-LEAVED WEEDS (2 - 5 CM ACROSS)	CONSIDER WEED SHADING					
	POST-EM SELECTIVE HERBICIDES	BROAD-LEAVED WEEDS (MORE THAN 5 CM ACROSS)	PENETRATE INTO CROP CANOPY					
	EYESPOT FUNGICIDES AND PLANT GROWTH REGULATORS	CROP STEM AND LOWER LEAVES	PENETRATION TO BASE OF CROP					
	CEREAL FUNGICIDES T0, T1, T2	CROP LEAVES AND LEAF AXILS	PENETRATE CROP CANOPY					
	OSR FOLIAR FUNGICIDES	CROP LEAVES	COVERAGE FROM TOP TO BASE					

DOBRE IN SLABE PLATI UPORABE ANTIDRIFTNIH ŠOB PRI APLIKACIJI HERBICIDOV (M. Lešnik)

Dobro:

- Omejevanje zanašanja herbicida (omogočanje aplikacije neselektivnih herbicidov v bližini občutljivih območij in aplikacija visoko hlapnih hormonskih in drugih herbicidov (npr. klomazon) bližje občutljivim območjem)
- Omogočanje večje vozne hitrosti, delo z širšimi škropilnimi armaturami in povečujejo storilnost dela
- Omogočajo boljše prodiranje herbicida v notranjost sestojev visokih plevelov na travinju, v trajnih nasadih in na njivah z direktno setvijo poljščin
- Omogočajo zmanjševanje fitotoksičnosti herbicida za nekatere gojene rastline, ker omogoča večje stekanje škropilne brozge z gojene rastline (npr. čebula, zelje, soja, oves, vrtnica, …)
- Omogočajo nanos herbicida v suhem, pri višjih temperaturah in v razmerah z veliko prahu

Slabo:

- Lahko se zmanjša učinkovitost zatiranja trav tako v zgodnjih, kot v višjih razvojnih stadijih
- Lahko zmanjšajo učinkovitost delovanja herbicidov pri škropljenju na mokre plevele in so manj primerne za nočna škropljenja (RAZEN V PRIMERU TEMPERATURNE INVERZIJE)
- Lahko zmanjšajo učinkovitost delovanja herbicidov pri dlakavih plevelih, če uporabimo majhno količino vode
- Pri slabo delujočih škropilnicah je poslabšanje učinkovitosti zaradi slabe aplikacije večje, kot pri standardnih šobah

KAKO ZMANJŠAMO NEGATIVNE UČINKE ANTIDRIFTNIH ŠOB NA UČINKOVITOST HERBICIDOV???:

- ZA 20 % POVEČAMO PORABO VODE
- UPORABIMO ŠOBE Z ZAMAKNJENIM CURKOM (CUREK USMERJEN NAZAJ ALI / in / NAPREJ)
- NAMESTO ŠOBE Z ENIM CURKOM IZBEREMO ŠOBO Z DVEMA CURKOMA
- ŠKROPILNI BROZGI DODAMO USTREZNA SPECIFIČNA OMOČILA IN ŠKROPIMO PRI SREDNJE VELIKI PORABI VODE (250 DO 300 L/HA).

SPLOŠNA PRIPOROČILA GLEDE OPTIMALNE VELIKOSTI KAPLJIC IN PORABE VODE ZA APLIKACIJO HERBICIDOV S STANDARDNIMI ŠOBAMI
KONEZERVATIVNI PRISTOP ZA UPORABO ZASTARELE ŠKROPILNE TEHNIKE KOT JO IMAMO VEČINOMA PRI NAS
V TUJINI IMAJO VEČJE HITROSTI VOŽNJE IN ZA 20 % MANJŠE PORABE VODE KOT PRI NAS (M. Lešnik):

Značilnosti prevladujoče plevelne populacije:	Poraba vode:	Velikost kapljic VMD
Enoletni širokolistni pleveli – nižji stadiji – ni veliko voščenih ali dlakavih vrst – sistemični herbicid	250 l/ha	250 µm
Enoletni širokolistni pleveli – nižji stadiji – ni veliko voščenih ali dlakavih vrst – kontaktni herbicid	200 l/ha	150 µm
Enoletni ozkolistni pleveli – nižji stadiji – sistemični herbicid	200 l/ha	120-150 µm
Enoletni ozkolistni pleveli – nižji stadiji – kontaktni herbicid	150 l/ha	100 µm
Enoletni širokolistni pleveli – nižji stadiji – veliko voščenih ali dlakavih vrst – sistemični herbicid	200 l/ha	180-200 µm
Enoletni širokolistni pleveli –nižji stadiji - veliko voščenih ali dlakavih vrst – kontaktni herbicid	180 l/ha	150 µm
Enoletni širokolistni pleveli – višji stadiji – sistemični herbicid	250 l/ha	200 µm
Enoletni širokolistni pleveli – višji stadiji – kontaktni herbicid	300 l/ha	200 µm
Večletni širokolistni pleveli – višji stadiji – sistemični herbicid	300 l/ha	250 µm
Večletni širokolistni pleveli – višji stadiji – kontaktni herbicid	400 l/ha	200 µm
Večletni ozkolistni pleveli – višji stadiji – sistemični herbicid	150 l/ha	150 µm
Večletni ozkolistni pleveli – višji stadiji – kontaktni herbicid	100 l/ha	100 µm

http://sprayers101.com/selecting-the-right-water-volume/ AMERIŠKA PRIPOROČILA ANTIDRIFTNE ŠOBE

Table 1. Herbicide modes of action, minimum water volumes with low-drift nozzles, and maximum spray quality

Herbicide Mode of Action Group	*Example Active Ingredients*	*Water Volume (US gpa)*	*Spray Quality*	*Wilger Tip Wizard VMD (µm) (wilger.net)*
1	clodinafop, pinoxaden, clethodim, fenoxaprop	7 - 10 70-80 L/HA	Medium - Coarse	220-400
2 (broadleaf)	thifensulfuron, tribenuron, florasulam	6 - 10 60-70 L/HA	Coarse – Very Coarse	270-460
2 (grass)	pyroxsulam, flucarbazone-sodium, thiencarbazone, imazamox	7 - 10	Medium - Coarse	220-400
4	2,4-D, MCPA, dicamba, clopyralid, fluroxypyr	6 - 10	Coarse – Very Coarse	270-460
9	glyphosate 40-50 L/HA	3 - 5	Coarse – Very Coarse	270-460
6	bromoxynil	7 - 10	Medium - Coarse	220-400
10	glufosinate 110-130 L/HA	10 - 12	Medium - Coarse	220-400
14	carfentrazone (Aim) saflufenacil (Heat) 80-90 L/HA	8 - 10	Medium - Coarse	220-400
22	diquat 130-160 L/HA	10 - 15	Medium - Coarse	220-400
27	pyrasulfotole (Infinity, Velocity M3)	7 - 10	Medium - Coarse	220-400

AXIAL

Primer jasnega navodila o neprimernosti antidriftnih venturi šob

PRODUCT USE

HERBICIDE

Spray Quality

Apply AXIAL using a conventional fan nozzle producing a spray quality at the finer end of the medium range. Do not use pre-orifice and air induction nozzles as these may give reduced control, which in high weed populations can prove unacceptable. A spray pressure of 2–3 bars is recommended.

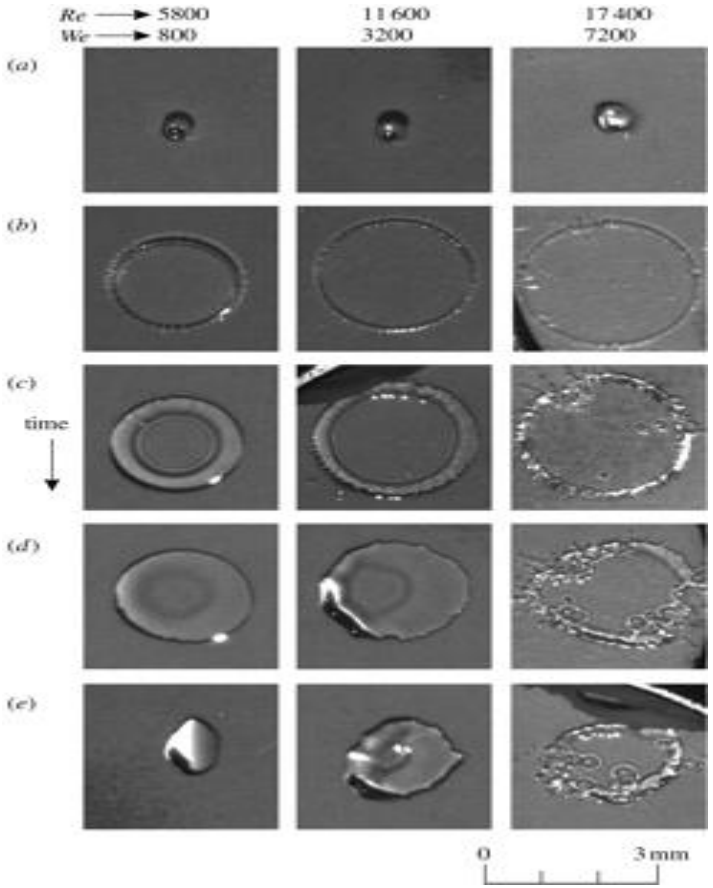
Spray Volume

Spray AXIAL in 100–400 litres of water per hectare.

Use of adjuvants

AXIAL must always be used with ADIGOR adjuvant. The adjuvant should be applied at 0.5% concentration of spray volume, however this may increase to a maximum concentration of 1% of the spray volume where water volumes lower than 200 litres/ha are used.

- Nekatere izkušnje ANTIDRIFTNE ŠOBE – domači poskusi:
- Pri visoko sistemičnih herbicidih pri porabi vode od 180 do 350 l/ha pri škropljenju širokolistnih plevelov (2 do 5 listov) ni bistvenih razlik, če imamo kapljice z VMD med 200 in 350 µm.
- Pri kontaktnih herbicidih pri porabi vode od 200 do 300 l/ha pri škropljenju širokolistnih plevelov (2 do 5 listov) ni bistvenih razlik, če imamo kapljice z VMD med 150 in 300 µm.
- Pri zatiranju večletnih širokolistnih plevelov s sistemičnimi herbicidi ne pričakujemo večjega padca učinkovitosti, če VMD povečamo od 200 celo do 500 µm pod pogojem, da imamo porabo vode 250 l/ha ali več.
- Pri sistemičnih herbicidih za zatiranje trav v nižjih razvojnih stadijih (FOP, DIM, sulfonilsečnina, triketoni, …) lahko pričakujemo zaznaven padec učinkovitosti, če VMD preseže 250 µm in je poraba vode manjša od 200 l/ha. Težava je premajhno število zadetkov kapljic na cm2.
- Pri sistemičnih herbicidih za zatiranje trav v višjih razvojnih stadijih (FOP, DIM, sulfonilsečnina, triketoni, glifosat, …) lahko pričakujemo zaznaven padec učinkovitosti, če VMD preseže 200 µm in je poraba vode manjša od 200 ali večja od 300 l/ha. Težava je stekanje s površine.
- Pri kontaktnih herbicidih za zatiranje trav v višjih razvojnih stadijih lahko pričakujemo zaznaven padec učinkovitosti, če VMD preseže 250 µm in je poraba vode manjša od 250 ali večja od 300 l/ha. Težava je stekanje s površine.
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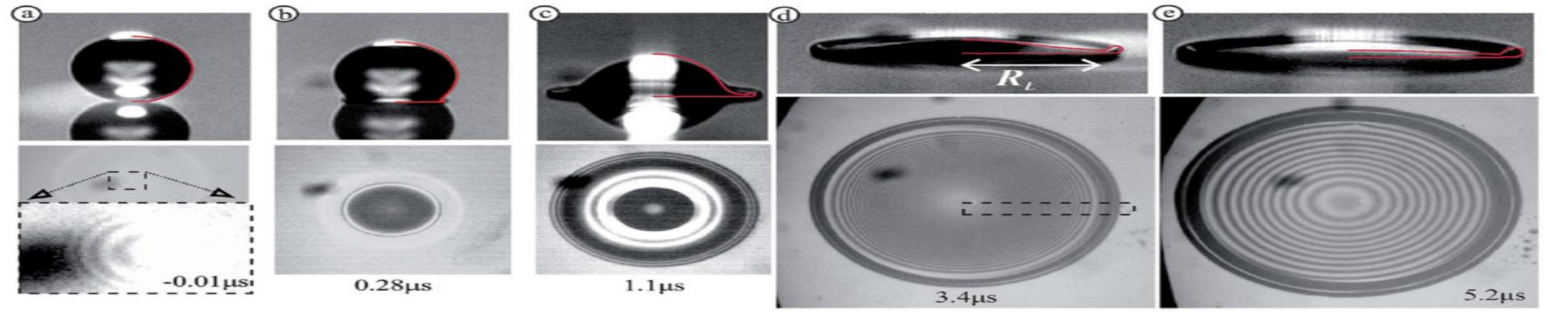
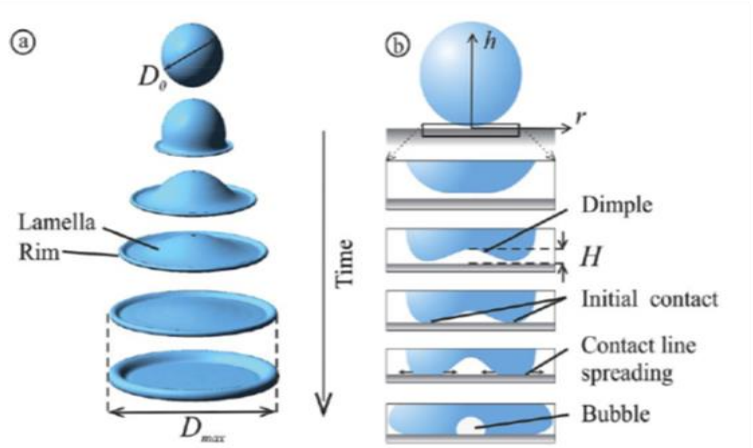
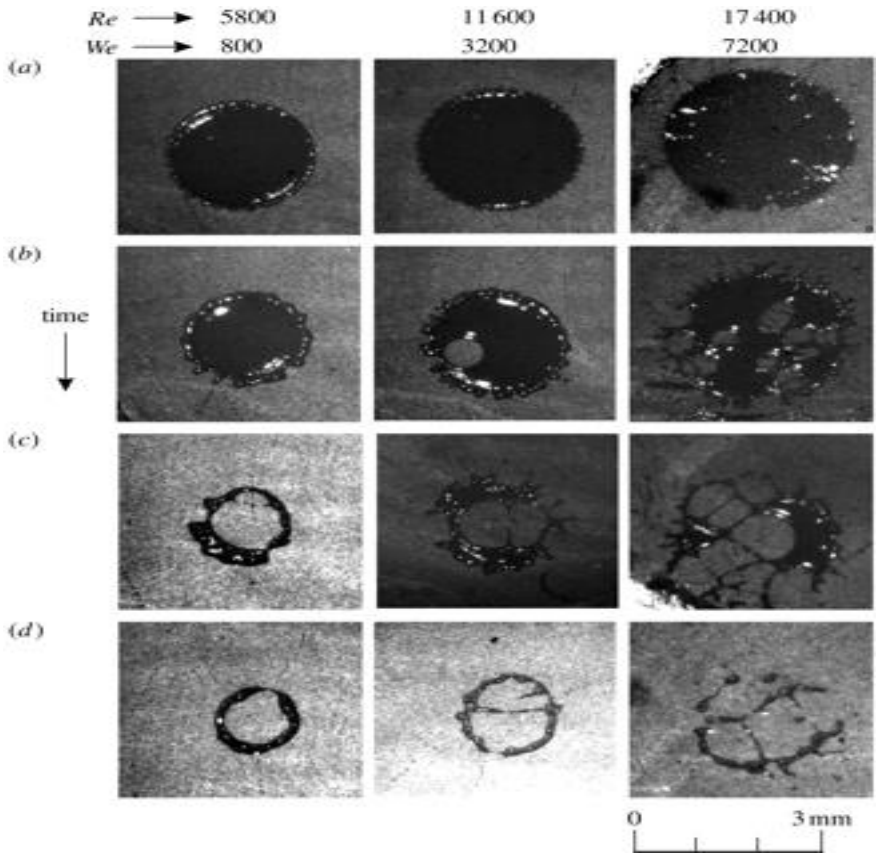
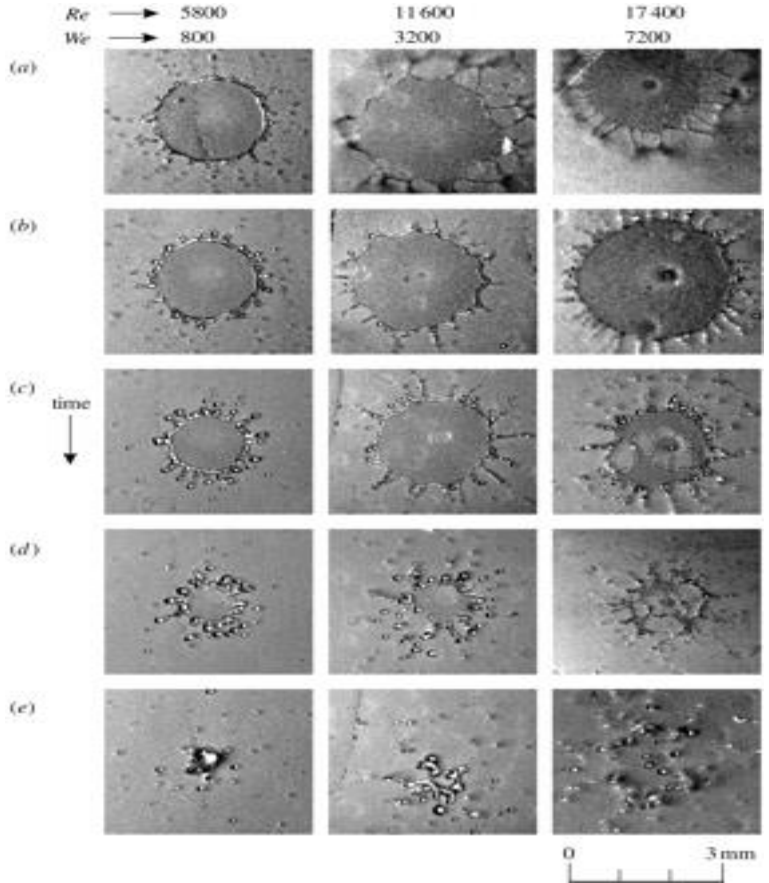


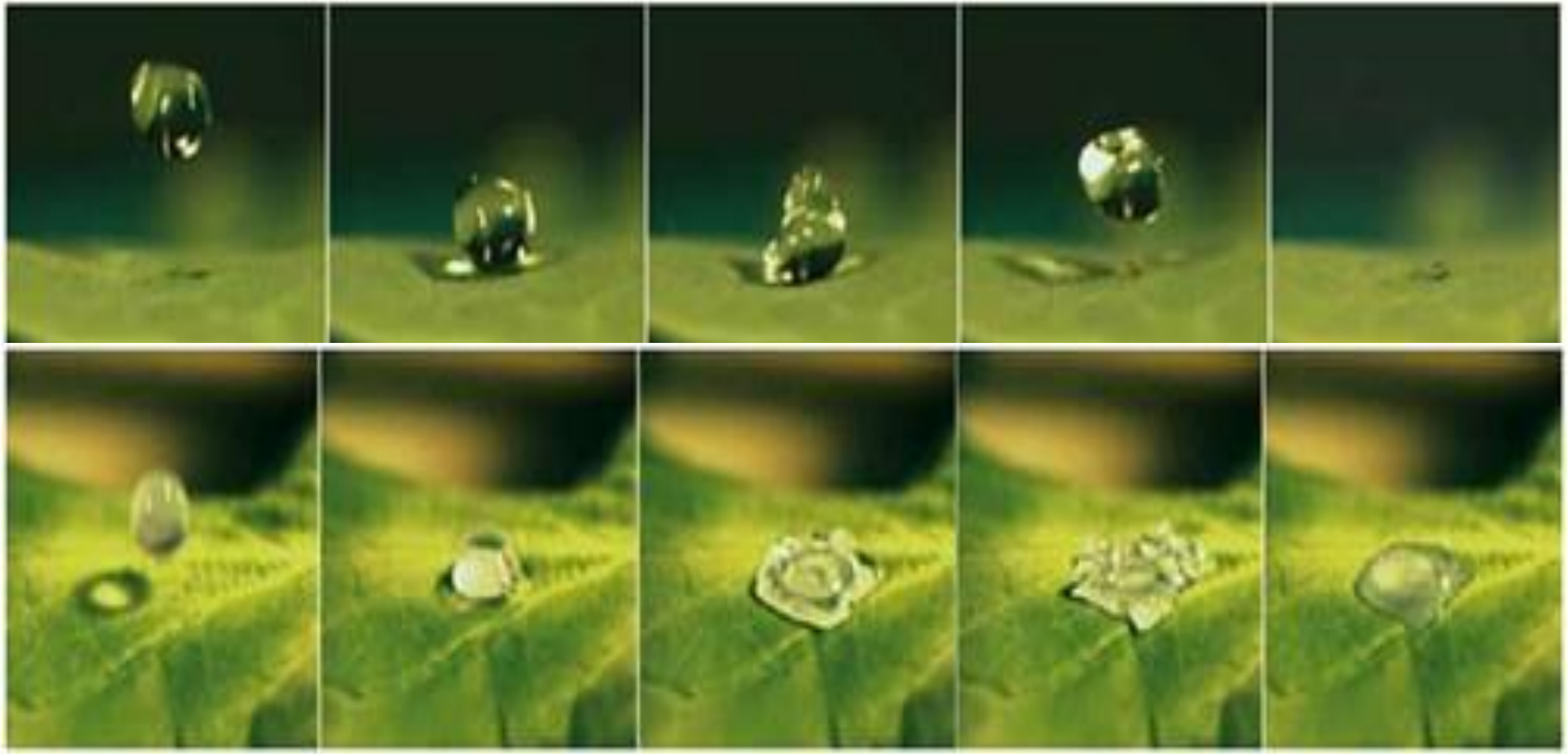
Fig. 6 Side- and bottom-view snapshots of a water droplet impacting onto dry glass for five different times (displayed in the bottom-view images). The side views include the numerically obtained droplet contour (red line, plotted in the right half of the image, see main text). The dark, blurred spots in the bottom view are caused by dirt on the bottom side of the glass. The inset in figure (a) shows air-fringes (explained in main text). The dashed rectangle in figure (d) is magnified in Fig. 7a. Impact parameters: $D = 49.5\ \mu m$ and $V = 16.9\ m\ s^{-1}$, corresponding to $Re = 836$, $We = 196$, and $St = 2.2 \times 10^4$.

ZA USTREZNO IZBIRANJE ŠOB IN DODATKOV JE POTREBNO MINIMALNO RAZUMEVANJE FIZIKE GIBANJA IN TRČENJA KAPLJIC TER OBLIKOVANJA DEPOZITA









OSNOVNI PROBLEM APLIKACIJE – KAKO OBDRŽATI KAPLJICE NA CILJNI POVRŠINI

Primerjava trčenja dveh kapljic. Pri zgornji omočilo ni dodano in pride do odboja, ker je površinska napetost ciljne površine in kapljice velika. Pri spodnji je površinska napetost kapljice močno zmanjšana zaradi dodatka omočila in kapljica se ob trku takoj splošči in prilagodi površini.

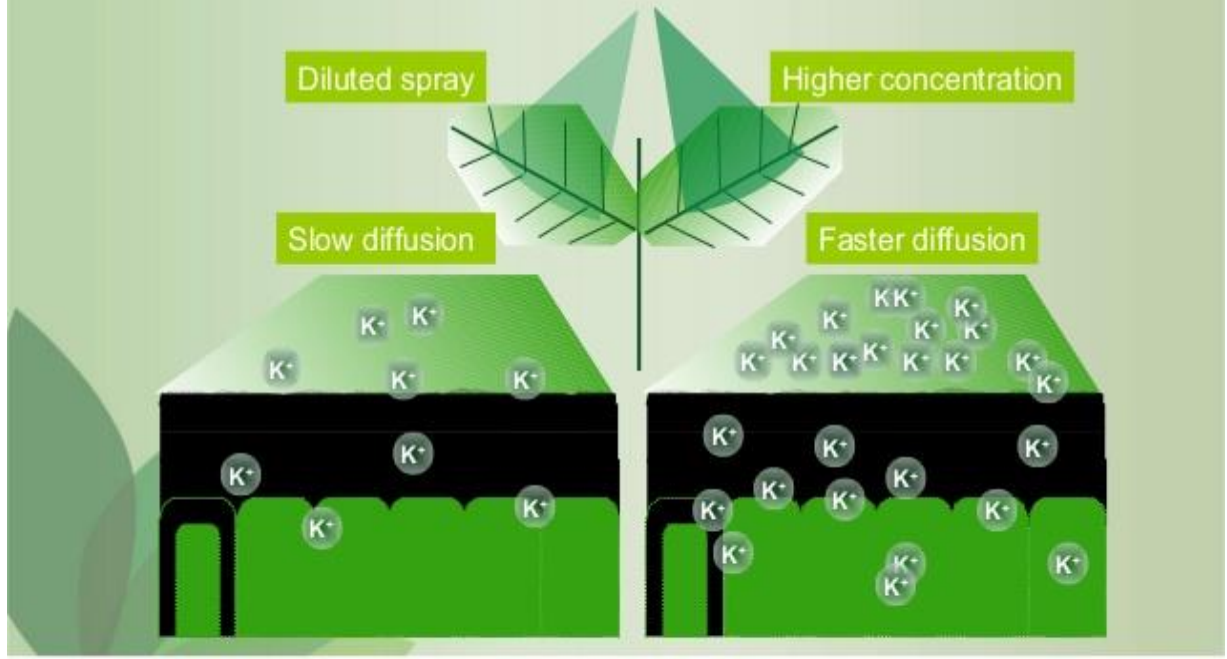
Vstopanje herbicida s pasivno difuzijo – pomembna je čim večja razlika v koncentraciji med površino in notranjostjo lista – hitra izsušitev herbicidnega filma po aplikaciji omogoča nastanek velikega koncentracijskega gradienta – do hitre izsušitve pride, če je v formulaciji veliko alkoholov. To je bolj izraženo pri lipofilnih kontaktnih herbicidih (npr. piridat).

Pri nekaterih herbicidih (bolj hidrofilni kontaktni; npr. bentazon) pa si želimo podaljšanje mokre faze (dodajanje humektantov). Dodatki lahko pri mnogih herbicidih v notranjosti struktur celic povrhnjice povzročijo gibanje od manjše k večji koncentraciji (to izkoriščamo pri herbicidih na podlagi glifosata).

Penetration by passive diffusion

- It is thought that passive diffusion is responsible for the majority of the penetration
- Uptake rate depends on solute concentration on the leaf surface
- Concentration depends on
  - Spray concentration
  - Relative humidity (that determines the rate of water evaporation from the sprayed solution)
- Efficiency of uptake by passive diffusion improves
  - As the rate of solute that can be applied to leaf surface without causing damage is higher
  - As the time it remains in active state on the leaf surface is longer

Passive diffusion: uptake is proportional to spray concentration



Humektanti upočasnijo izsušitev kapljic obloge škropilne obloge kar omogočijo daljši čas za prehajanje herbicidov, ki so vodotopni in zelo težko prehajajo skozi lipofilne voščene strukture. Možen je tudi učinek nabrekanja zunanje stene celic povrhnjice zaradi vrivanja molekul vode – nastanek razširjenih hidrofilnih kanalov.

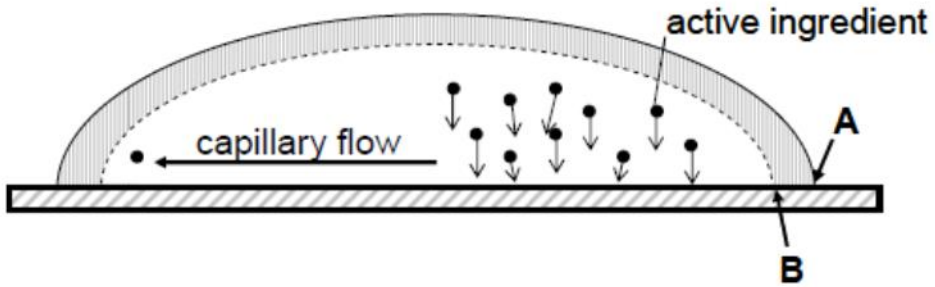
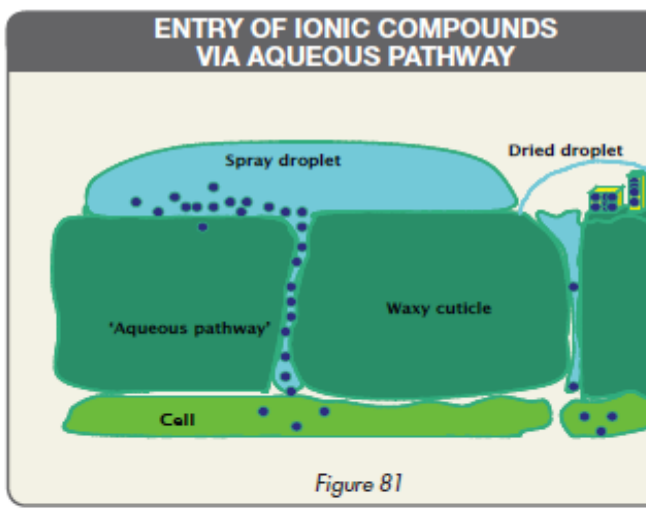
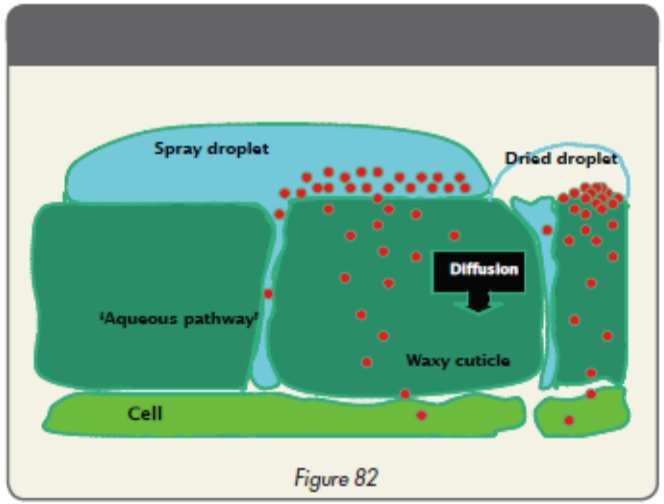


Figure 1: Schematic illustration of an evaporating droplet (modified after Deegan *et al.*, 2000; Faers, 2007). During evaporation, the air/water interface moves from the solid line to the dashed line, and the contact line will move from A to B. The active ingredient precipitates out as a residue at the contact line between droplet and leaf surface.





Prehitra izsušitev obloge pogosto zmanjša učinkovitost hidrofilnih herbicidov.

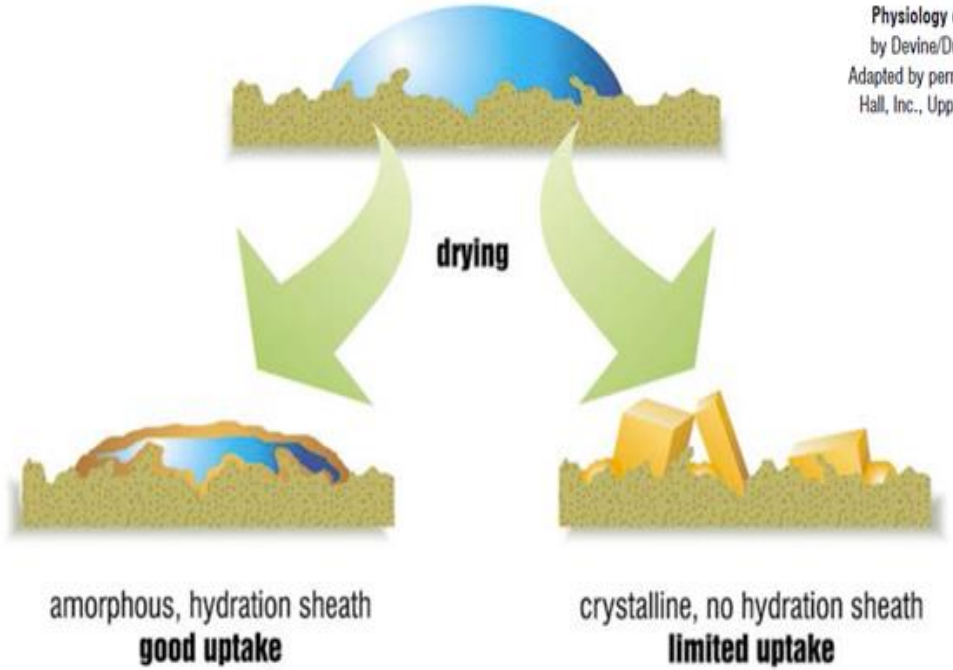


Figure 71. Upon drying, spray droplets can form amorphous deposits surrounded by a hydration sheath, which provides a route of uptake into the plant (left), or a crystalline deposit, from which active ingredients have a much harder time penetrating.

Also Know As...

SPLOŠNO IZRAZOSLOVJE GLEDE KEMIČNIH POMAGAL PRI PRIPRAVI ŠKROPILNE BROZGE FFS (ADJUVANTS)

Penetrants - Activators | Solvents | Methylated Oils

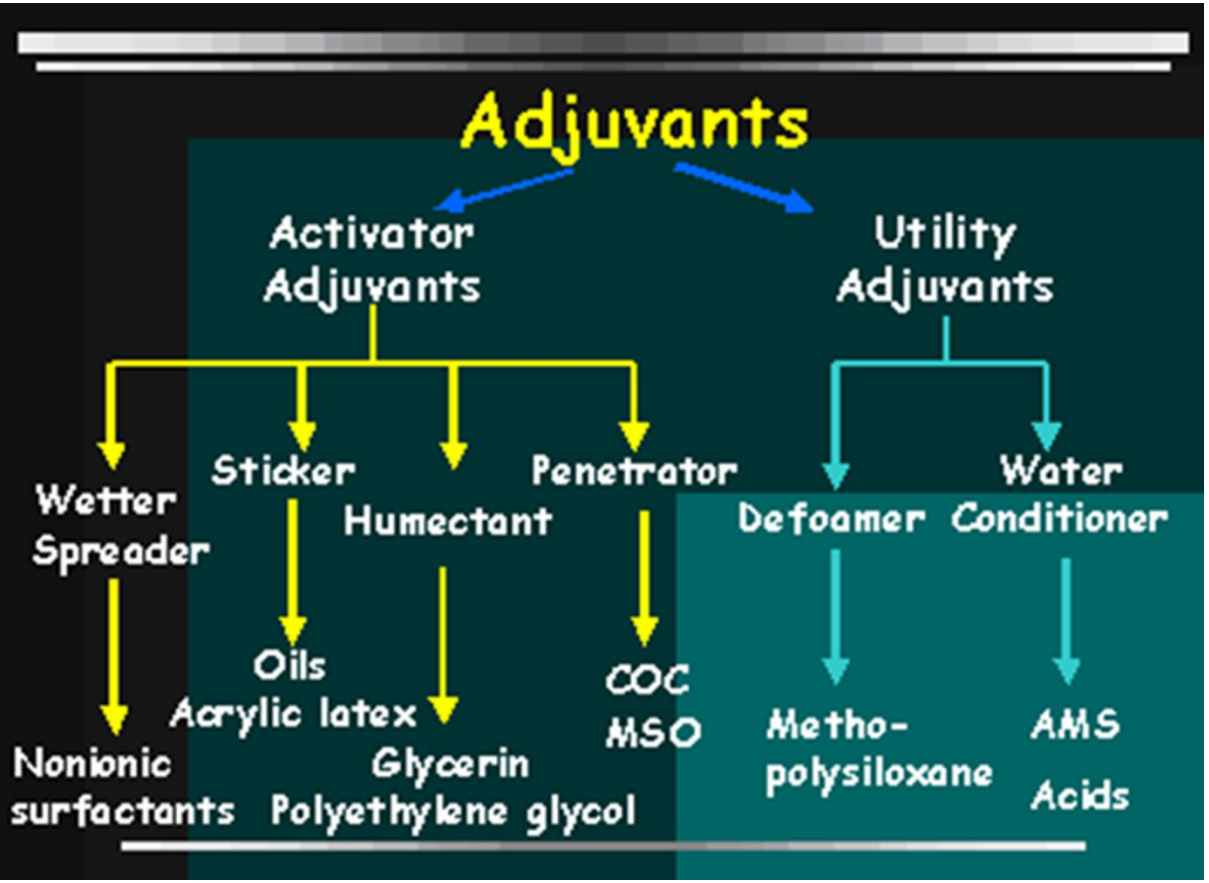
Spreaders - Crop Oils | Crop Oil Concentrates | Wetters | Wetting Agents | Vegetable Oils

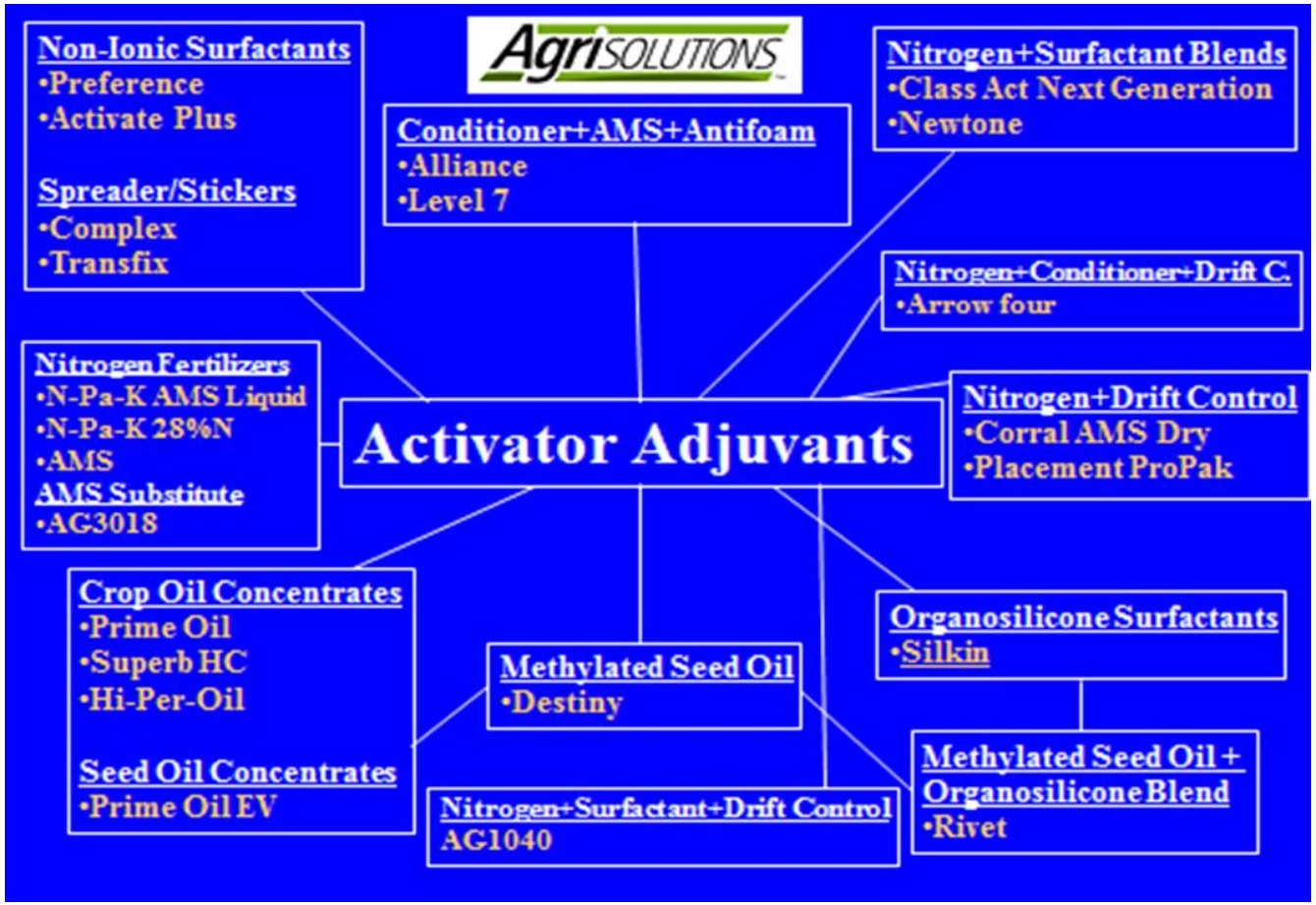
Buffers - Acidifiers | Water Conditioning Agents | pH Adjusters | Buffering Agents

Compatibility Agents - Suspension Agents | Blending Agents | Dispersants | Binders

Drift Control Agents - Thickeners| Deposition Agents | Drift Retardants

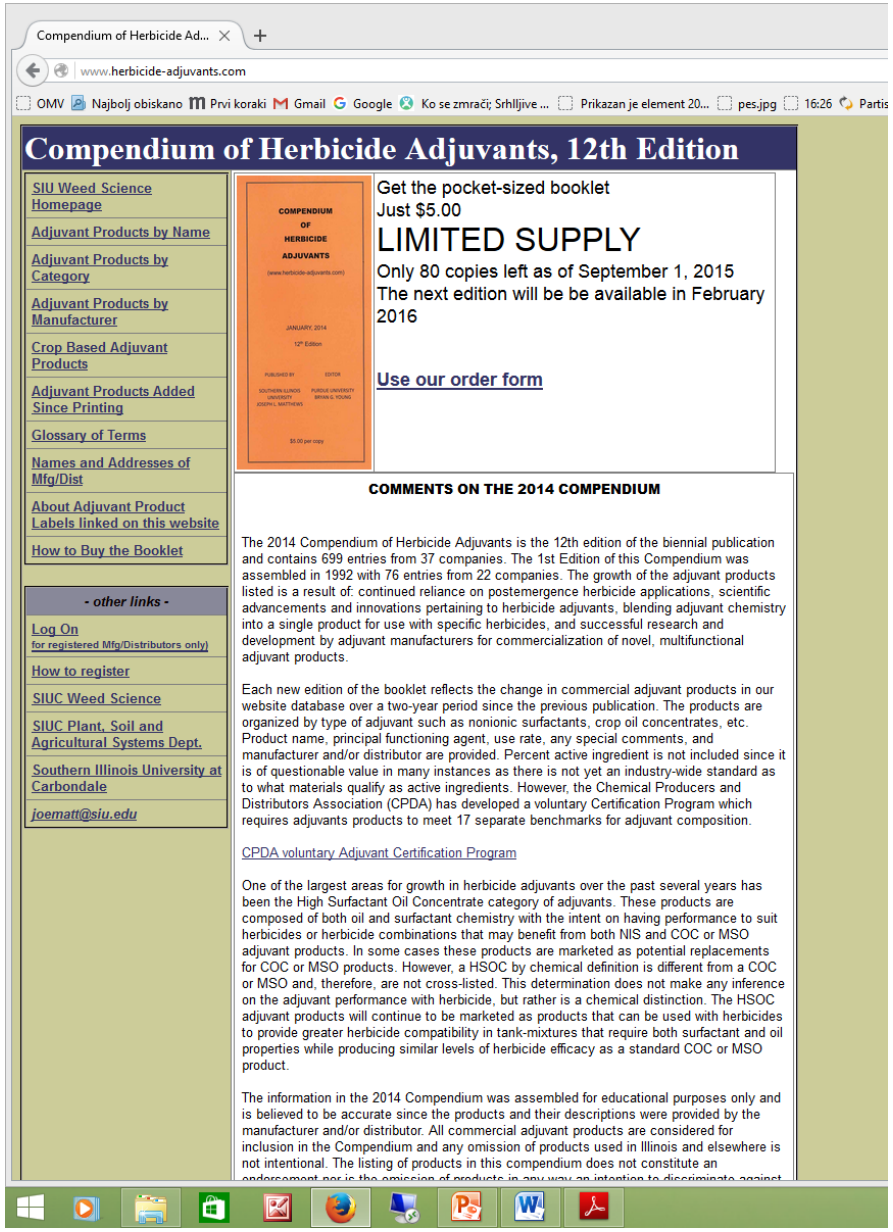
Anti-Foam Agents - Defoamers | Foam Suppressants





http://www.herbicide-adjuvants.com

Compendium of Herbicide Adjuvants: Deposition (Drift Control) and/or Retention Agent



American Society for Testing and Materials (ASTM) Standard Terms and Definitions

Acidifier
A material that can be added to spray mixtures to lower the pH.
Activator
A material that increases the biological efficacy of agrichemicals.
Active Ingredient
A component of the formulation that produces a specific effect for which the formulation is designed.
Adjuvant
A material added to a tank mix to aid or modify the action of an agrichemical, or the physical characteristics of the mixture.
Anionic Surfactant
A surface-active agent in which the active portion of the molecule containing the lipophilic segment forms exclusively a negative ion (anion) when placed in aqueous solution.
Antifoaming Agent
A material used to inhibit or prevent the formation of foam.
Attractant
A material that attracts specific pests.
Basic Blend
(Definition from the Editor) An adjuvant that raises the pH of the solution and contains a nitrogen source.
Buffer or Buffering Agent
A compound or mixture that, when contained in solution, causes the solution to resist change in pH. Each buffer has a characteristic limited range of pH over which it is effective.
Canopy Penetrating Agent
An adjuvant that increases the penetration of the spray material into the crop canopy. See *deposition aid*.
Cationic Surfactant
A surface-active agent in which the active portion of the molecule containing the lipophilic segment forms exclusively a positive ion (cation) when placed in aqueous solution.
Colorant
A material used to alter the color of the tank mix.
Compatibility Agent
A surface-active agent that allows simultaneous application of liquid fertilizer and agrichemical, or two or more agrichemical formulations, as a uniform tank mix, or improves the homogeneity of the mixture and the uniformity of the application.
Crop Oil Concentrate
An emulsifiable, petroleum oil-based product containing 15% to 20% w/w surfactant and a minimum of 80% w/w phytobland oil.
Crop Oil (Emulsifiable)
An emulsifiable, petroleum oil-based product containing up to 5% w/w surfactant and the remainder of a phytobland oil.
Crop Oil (Nonemulsifiable)
See *phytobland oil*.
Defoaming Agent
A material that eliminates or suppresses foam in the spray tank.

GLAVNE VRSTE DODATKOV HERBICIDNIM ŠKROPILNIM BROZGAM:

COC – PENETRANTI IN ADHEZIVI (CROP OIL CONCENTRATES) MINERALNA IN RASTLINSKA OLJA

VOC – PENETRANTI IN ADHEZIVI (VEGETABLE OIL CONCENTRATE) NEZAESTRENA RASTLINSKA OLJA

MVOC – PENETRANTI IN ADHEZIVI (METILATED OIL CONCENTRATE) METILIRANA ZAESTRENA RASTLINSKA OLJA

HSOC - PENETRANTI IN ADHEZIVI (HIGH SURFACTANT OIL CONCENTRATES)

ANIONSKA OMOČILA

KATIONSKA OMOČILA

NEIONSKA OMOČILA

SILIKONSKA OMOČILA

AMFOTERIČNA OMOČILA

POLIMERNA IN LATEX OMOČILA, ADHEZIVI, DRIFT RETARDANTI

POLIMERNI IN INPLACE-INVERT-EMULSIONS DRIFT RETARDANTI

FOSFOLIPIDNA OMOČILA, FOSFATNI ESTRI IN LECITINSKI DERIVATI

POLIGLUKOZIDNA OMOČILA

NARAVNE SMOLE – TERPENSKI ADHEZIVI IN PROTEKTANTI

DUŠIČNI AMONIJSKI DODATKI (NPR. AMONSULFAT)

Table 1. Adjuvants used in the study

Trade name	Registered rate of the product (kg/ha)	Active ingredient (active ingredient content)
ADIGOR	1.35	rapeseed oil methyl ester (440 g/L)
ATPLUS 463	1	paraffin oil (60%), polyoxyetylene sorbitol oleate (40%), polyoxyetylene tridecyl alcohol
BIOPOWER	1	sodium lauryl sulphate (280 g/L)
BREAK SUPERB	0.1	polyether (15–30%), silanamine, polyether siloxanes and silicones (70–85%), heptamethyltrisiloxane
DASH HC	1	palmitic acid methyl ester and oleic acid methyl ester (37.5%), oleic acid (5%), phosphoric acid polyalkyl ester (22.5%)
DEDAL 90 EC	3	rapeseed oil (90%)
MERO 33528	2	rapeseed oil methyl ester (730 g/L)
SILWET L-77	0.1	heptamethylt risiloxan modified polyalkylenoxidem (84%)
SILWET STAR	0.1	polyalkyleneoxid heptamethyl trisiloxane (80%), allyloxypolyethyleneglycol (20%)
TREND 90	0.2	isodecyl alcohol ethoxylate (900 g/L)
X-CHANGE	0.2	ammonium sulphate, polyacrylate Na(I)NH_4(I) (10%), citric acid (10%), ammonium propionate (20%), phosphate ester (5%)

Source: Agromanual (2010)

- OSNOVNE VRSTE FORMULACIJSKIH IN APLIKACIJSKIH DODATKOV
- ADJUVANT – KAMIČNO POMAGALO
- MOČILO – JE PRIPRAVEK, KI OMOGOČA POVEČAN OPRIJEM IN PREKRIVANJE CILJNE POVRŠINE NA RAČUN PROCESOV ZA SPREMINJANJE POVRŠINSKE NAPETOSTI, POVEČANEGA POVEZOVANJA MED OBLOGO HERBCIDA IN POVRŠINO RASTLINE IN PODALJŠANJA OBSTOJNOSTI

- UČINKI DODATKOV ZA IZBOLJŠANJE DELOVANJA FFF
- ZMANJŠEVANJE POVRŠINSKE NAPETOSTI KAPLJIC ŠKROPILNE BROZGE (LAHKO TUDI CILJNE POVRŠINE)
- POVEČANA VEZAVA MED FILMOM OBLOGE FFS IN POVRŠINO RASTLINSKE KUTIKOLE
- UPOČASNITEV IZPAREVANJA VODE IZ OBLOGE, KAR OMOGOČA DALJŠE OBDOBJE PREHAJANJA AKTIVNE SNOVI V RASTLINO PREDEN SE DEPOZIT POSUŠI IN NI VEČ PREHODA (vodotopni herbicidi)
- POVEČANJE OBSTOJNOSTI OBLOGE PROTI IZPIRANJU Z DEŽJEM ALI ZMANJŠANO RAZPADANJE ZARADI UV ŽARKOV ALI MANJ KEMIČNIH REAKCIJ Z AGRESIVNIMI SNOVMI NA POVRŠINI RASTLINE
- RAZTAPLJANJE POVRHNICE IN USTVARANJE ALI RAZMIKANJE KANALOV ZA VSTOPANJE AKTIVNIH SNOVI
- „CARRIER“ UČINKI – VEZAVA NA AKTIVNO SNOV IN SPREMEMBA POLARNOSTI IN ELEKTRIČNIH NABOJEV, DA JE VEČJI PREHOD SKOZI OVIRE
- SPREMEMBA RITMA ODPIRANJA REŽ IN POVRŠINSKIH NAPETOSTI NA REŽAH
- PREPREČITEV PREHITERGA KOLAPSA CELIC POVRHNJICE IN CELIC FLOEMOV, KAR LAHKO USTAVI PREHAJANJE HERBCIDIA PO FLOEMIH PROTI KORENINAM
- SPREMEMBA pH POVRHNJICE ALI ŠKROPILNE BROZGE IN PRED-VEZAVA NEŽELJENIH KATIONOV MINERALOV PRI HERBICIDIH, KI DELUJEJO KOT ŠIBKE KISLINE
- PREPREČITEV ALKALNE RAZGRADNJE AKTIVNE SNOVI HERBICIDA

ADDITIVE

PONEKOD PONUDNIKI JASNO OPREDELIJO RAZMERJE MED RAZLIČNIMI UČINKI NEKEGA DODATKA

Produkt	Bestandteile	Aufwand-menge	Wirkung				
			Benetzung	Anhaftung	Penetration	Ansäuerung*	Kationenbindung**
Access	**Paraffinöl** + Emulgator	0,5 - 1 l/ha	■■	■■■	■■■■		
Acxcess	Polymethyl Polyether **Trisiloxan**	0,1 l/ha	■■■■■■	■■■	■		
BreakThru S240	Polyether **Trisiloxan**	0,125 - 0,2 l/ha	■■■■■■	■■■	■		
Designer	Synth. **Latex** + **Alkohol-Ethoxylat** + Polyalkylen- **Trisiloxan**	bis 0,125 %ig	■■■	■■■■■■	■		
Du Pont Trend	Isodecyl **Alkohol-Ethoxylat**	0,1 %ig	■■■	■■■■	■■		
Exzellent CS7	**Alkohol-Ethoxylat** + Na-dioctyl-sulfosuccinat + Glykol	0,1 %ig	■■■	■■■■	■■■		
Hasten	**Rapsölethyl- u. methylester** + nicht-ionische Tenside	0,5 l/ha	■■■	■■■	■■■■		
Kantor	**Triglycerid** + **Fettsäure** + **Alkylpolyglycosid** + **Essigsäure**	0,15 %ig	■■■	■■■■	■■■■	■■	■■■
Kento	Polyether Polymethyl **Siloxan** + Styrol-**Acrylat**	0,1 %ig	■■■■	■■■■■■	■		
LI 700	Sojalecithin + **Alkohol-Ethoxylat** + **Fettsäuren** + **Propionsäure**	1 - 1,5 l/ha	■■■	■■■	■■■■■	■■■■■■	■■
Monfast	**Alkohol-Ethoxylat** + **Fettsäuren**	0,2 %ig	■■■	■■■	■■		
Oleo FC	**Paraffinöl** + Emulgator	0,5 - 1,5 l/ha	■■	■■■	■■■■		
Para Sommer	**Paraffinöl** + Fettalkohol	1 - 1,5 l/ha	■■	■■■	■■■		
pH FIX 5	Komponente 1 + Komponente 2 + **Alkohol-Ethoxylat** + Anorganische **Säure**	0,05 - 0,2 %ig	■■		■■■	■■■■■■	■■■■■■
Silwet Gold	**Trisiloxan** + Emulgator	0,025 - 0,1 %ig	■■■■■■	■■■	■		
Validate	Lecithin + **Methylester** + **Alkohol-Ethoxylat**	0,25 %ig	■■■■	■■■	■■■■■	■■	■■
X-Change	**Zitronensäure** + **Polyacrylsäure** + Ammoniumsalze + Phosphorsäureester	0,1 - 0,25 %ig	■■	■■		■■■■■■	■■■■■■

*Verlangsamung des Wirkstoffabbaus (z.B. PMP, DMP ...) durch pH-Absenkung.

**Schutz vor Komplexbildung bestimmter Wirkstoffe (z.B. Glyphosat, Debut, Quinmerac, Clopyralid ...) mit Ca- und Mg-Ionen in hartem Wasser.

Additive mit starker Benetzung können bei feuchtem Blatt und insbesondere bei stark benetzenden Pflanzenschutzmitteln (z.B. Bet. maxxPro) zum Ablaufen der Spritzbrühe führen.

HaGe
Ihr Partner vor Ort

Funktionen und Einsatzbereiche ausgewählter Zusatzstoffe

Produkt	Inhaltsstoffe	Aufwand-menge	Funktion			Einsatzschwerpunkt
			Netz-mittel	Haft-mittel	Penetra-tions-mittel	
Designer +	255,25 g synthetisches Latex, 105,67 g Alkoholethoxilat, 85,76 g Polyalkylenmodifiz. Trisiloxan + Frostschutz + Entschäumer + Wasser	0,125 l/ 100 l Spritzbrühe	●●●	●●●	●●	Netz- und Haftmittel (= bessere Regenfestigkeit, Abdriftminderung + Verteilung) + verbesserte Durchdringung / Wirkstoffaufnahme von PSM u. spritzbaren Düngern
DuPont Trend	90 % Isodecylalkoholethoxylat	0,3-0,5 l/ha	●●●	●●●	●	Netz- u. Haftmittel, dass die Benetzungsfähigkeit u. Regenbeständigkeit von Spritzbrühen verbessert. + Verstärkung der Blattaktivität von Sulfonylharnstoffen; v.a. in Mais. Kartoffeln, Zucker- u. Futterrüben
FCS Rapsöl	810 g/l Rapsöl + natürlichem Emulgator	0,3-0,5 l/ha	●●	●	●	Universeller Zusatz im Acker-, Gemüse- und Obstbau
Li – 700	35 % modifiziertes Sojalecitin, 35 % Propionsäure, 10 % AAPOE (Haftmittel)	0,5-1,0 l/ha	●	●	●●●	zur Unterstützung d. Wirkstoffaufnahme u. Erhöhung d. Wirkungssicherheit v. PSM u. Spurennährstoffdüngern
Mero *	81 % Rapsölmethylesther	0,5-1,0 l/ha	●●	●	●●●	Zusatz zur Optimierung blattaktiver Wirkstoffe
MonFast	60 % etholysierte Fettalkohole, 25 % Propylenglycol (nicht-ionischer Charakter)	0,2 l/ 100 l Spritzbrühe	●	●	●	Spezieller Zusatz für das Sulfonylharnstoff-Herbizid Monitor
Oleo FC (Agraröl)	94 % Paraffinöl 6 % Emulgatoren	0,5-1,0 l/ha	●	●		Verbesserte Wirkstoffaufnahme + Wirkungsverbesserung von PSM insbes. von Herbiziden
Profi SchaumStopp ++	33 % Polydimethylsiloxan 5 % Emulgator	1,4 ml /100 l Spritzbrühe				Antischaummittel zur Verminderung der Schaumbildung beim Ansetzen der Spritzbrühe im Tank
Silwet Gold	80 % Polyethermodifiziertes Trisiloxan + 20 % Emulgator	50-100 ml/ha	●●●	●	●●	Verbesserte Wirkstoffaufnahme auch bei niedrigen Wassermengen
Arma / Spartan	500 g/l Fettaminalkoxylat, 400 g/l Polyethylene Monolaurat 100 g/l Essigsäure	0,1 – 0,15 l/ 100 l Wasser	●●(●)	●●	●●●	pH-Pufferung des Wassers (Verringerung der Wasserhärte), zur Reduzierung der Wasser-AWM, für alle Herbizide (außer „Abbrenner“), Fungizide, Wachstumsregler, Insektizide + Spurennährstoffe

* nur im Pack erhältlich ● = Symbol für Funktion und Intensität bzw. Funktionsschwerpunkt **Stand: Juni 2009**

+ Exklusivvertrieb der HaGe in M.-V. + S.-H.!

++ Profi ist ein eingetragenes Warenzeichen der Hauptgenossenschaft Nord AG

OCENA RAZMERJA LASTNOSTI V SLOVENIJI NAJBOLJ POGOSTO UPORABLJENIH DODATKOV (mnenje M. Lešnik)

Pripravek:	Omočenje SPREADER WETTER	Adhezivnost STICKER ADHESIV	Pentriranje in hidratacija PENETRANT ACTIVATOR HUMECTANT	Obstojnost EXTENDER	pH, minerali MODIFIER STABILITY AG. CONDITIONER
Break Thru	+++++	+++	+++	+++	
Etalfix	++++++	++++	++	++	
Sylwett	++++++	++	++	+	
Extravon	+++++	++	+	+	
Trend	+++++	+++	+++	+++	
Sandovit	++++	+++	+++	+++	
Citowett	++++++	++	+	+	
Dash	++++	+++++	++++	+++	
Mero	+++	+++	+++++	++++	
Gondor	+++	++++	+++++	++++	++
Sticman	++	+++++	+++	+++++	+
Nu-film		+++++++	+	+++++++	

Surfactants are specific

- **Pesticide specific - work well with some pesticides but not all.**
  - *Example: Nonionic surfactants work well with glyphosate, while petroleum oil-based surfactants inhibit glyphosate performance.*
- **Weed specific - work with some weeds but not all.**
  - *Example: Oil based surfactants are generally more effective for annual grasses or weeds that have waxy cuticles.*
- **Environment specific - soil moisture, temperature, humidity.**
  - *Examples: NIS provide better crop tolerance during high humidity than OBS. MSO-based surfactants provide better control during very dry conditions than COC.*

PONEKOD IMAJO NA TRGU VEČ STO FORMULACIJSKIH DODATKOV

Table 2b: Surfactant types according to electrical charge on the hydrophilic group

Surfactant type	Charge on hydrophilic group	Hydrophilic group examples
Anionic	Negative	Sulphate
		Sulphonate
		Ether sulphate
		Ether phosphate
		Ether sulfosuccinate
		Ether carboxylate
		Carboxylate
Cationic	Positive	Primary ammonium
		Secondary ammonium
		Tertiary ammonium
		Quaternary ammonium
Amphoteric	Positive and negative	Amine oxide
		Betaine
		Amino carboxylate
Non ionic	No charge	Polyoxyethylene (ethoxylate)
		Acetylenic
		Monoethanolamine
		Diethanolamine
		Polyglucoside

Table 2c: Oil adjuvants commonly used in agricultural applications by the amount and type of emulsifier added

Petroleum spray oils (1–3% emulsifier)	Petroleum spray oil plus surfactant (5% emulsifier)	Petroleum spray oil concentrates (>15% emulsifier)	Vegetable oils (emulsified)	Vegetable oils (esterified and emulsified)
Ad-Here™ [970 mL/L]	Bolster [838 g/L]	Adjuvator [582 g/L]	Biotrol oil	Activoil
Broadcoat® [846 g/L]	D-C-Trate® [839 g/L]	Agridex® [730 g/L]	Chemag Extend	Adigor® (plus liquid hydrocarbons)
Empower [861 g/L]	D-C-Tron® Cotton [827 g/L]	Amplify® [432 g/L]	Chemtrol	Bolster (blend with buffering agent)
SACOA AntiEvap [859 g/L]	Rulvapron [838 g/L]	Austec Spraying Oil [582 g/L]	Codacide®	Dasher
SACOA CottOil [859 g/L]	SACOA Crop Shield [838 g/L]	AW Power Tek [432 g/L]	Ecotrol	Effectivoil
	Trump™ [830 g/L]	Bonza® [411 g/L]	Endorse	Fastup™
		Canopy® [792 g/L]	Envoy (blend with buffer and surfactants)	Glysarin 704
		D-C-Trate® Advance [653 g/L]	Intac	Hasten®
		Enhance™ [598 g/L]	Miller Exit	Impel
		Genboost [426 g/L]	Nexus™ Spray Adjuvant	Infiltrator
		Hot-Up [190 g/L]	Nuturf® Driftex	Kwickin®
		Hotwire® [598 g/L]	ProCanOil Spray Oil	Phase Dispersant Penetrant (soy)
		Hustle [582 g/L]	Protec® oil	Plantocrop
		In-bound® [653 g/L]	Rutec Control Oil	Promax
		Magnify [426 g/L]	Sacoa Xseed	Pronto
		PCT Reactor® [582 g/L	Simplot Oilon	Protec® Plus
		Powersurge [598 g/L]	Smart Crop Spray Oil	Racer Ultra
		Propel [432 g/L]	Spalding canola oil spray oil conc.	Rapid Oil
		Supercharge® [411 g/L]		Rocket®
		T-oil [432 g/L]		Swift

PONEKOD IMAJO NA TRGU VEČ STO FORMULACIJSKIH DODATKOV

Table 2a: Common agricultural surfactants by chemical types

Alcohol alkoxylates	Alkylaryl ethoxylates		Fatty amine ethoxylates	Organo-silicones	Other products with more than one active constituent
	Nonyl phenol	Octyl phenol			
Agri-Wet 1000	Agral®	Grass-Wett	Gly Wetter Plus	Break-Thru® Gold	Activator®, Miller-Wett, Drive®r (alkyl polyoxyethylene ether + free fatty acids)
All-Wett 1000	Agri-wet 377	Reactor 1040	Sonar (blend with alcohol ethoxylate)	Break-Thru® Penetrant	Bond (synthetic latex + alcohol ethoxylate)
Auswet 1000	Auswet 600	Silver-wet	Zest (blend with alcohol ethoxylate)	Broadspred Organosilicone	Bonza® (nonoxynol + fatty acids + paraffinic oil)
Bettawet	Cropwett 1000	Spalding 1040 Surfactant		Brushwet Organosilicone	Designer® (organosilicone + synthetic latex)
Blairs Bowa 200	Cropwett 600	Spray-Sure Wetter		Maxx Organosilcone Surfactant	di-1–p menthene (e.g. Nu-Film-P®, Hyper-Stik, Sprayfast, Flextend, Shur-Stik, Flexstic, Hygro-Stic)
BS1000	Dynawet 1000	Trilogy		Organowett	Envoy (vegetable oil + surfactant + buffer)
Chemwet 1000	EconA-wett 1000 (blend with alcohol ethoxylate)	Viti-wet		PCT Reactor® Penetrant	Hot-up (blend of non-ionic surfactants ammonium sulphate and petroleum oil)
Country Wetter 1000	Foliwet 600	Wetter TX		Prosil 1000	Kondemn (surfactant + ammonium sulphate + vegetable oil ester)
Deltawet 1000	Power 1000	Wettox 1040		Pulse®	LI 700 (soyal phospholipids)
Deploy 1000	Reactor Wetter 600			Spalding Penetrant	Tap® 700
Horti-wet 370	Shirwet® 600			Spray-Sure Penatra	Miller Spray-Aide®, Steadfast (alkylaryl polyoxyethylene glycol phosphate ester)
Kenwet 1000	Spreadwet 600			Sprinta Superwetter	Opal Tandem (ammonium sulphate + surfactant)
Lo-foam Wetting Agent	Wetspray 600			Takein II Organosilicone Surfactant	
Maxiwet 1000	Wetter 600				
Penetrate Wetter	Wetting Agent				
Pro Wet 1000					
Smart Wet 1000					

COC – PENETRANTI IN ADHEZIVI (CROP OIL CONCENTRATES) MINERALNA (PARAFINSKA) ALI REDKEJE RASTLINSKA OLJA Z MAJHNIM DODATKOM OMOČIL, KI OMOGOČAJO EMULGIRANJE

PRIMER PARAFINSKO OLJE, MINERALNO ULJE GENERA, BJELO ULJE (HLB JE OBIČAJNO ZELO NIZEK POD 5)

DELUJEJO SLABŠE PRI NIŽJIH TEMPERATURAH
PRI NIŽJI TEMPERATURI SE ZMANJŠA UČINEK KONTAKTNIH IN LIPOFILNIH HERBICIDOV

ZELO UPORANO KOT DODATEK PRI ZATIRANJU TRAV ZA KONTAKTNE HERBICIDE
NI DOBRO ZA PLEVELE, KI IMAJO GOSTE DOLGE TOGE DLAČICE, DOBRO ZA IZRAZITO VOŠČENE PLEVELE

IMAJO VISOKO VISKOZNOST IN POVEČUJEJO VELIKOST KAPLJIC – MANJŠI DRIFT

RAZTAPLJAJO POVRHNJICO PLEVELA (lahko tudi od gojene rastline)

DELUJEJO KOT ADHEZIVI IN KOT EKSTENDERJI

NISO PRIMERNI ZA MEŠANJE Z WDG FORMULACIJAMI ALI GLIFOSATNIMI PRIPRAVKI

SO PRIMERNI ZA IMIDAZOLINONE IN TRIKETONE IN ZA HERBICIDE, KI SO ZELO SLABO TOPNI V VODI (npr. kvizalofop, setoksidim, fluazifop, cikloksidim, …)

VOC – PENETRANTI IN ADHEZIVI (VEGETABLE OIL CONCENTRATE) NEZAESTRENA RASTLINSKA OLJA PRIDOBLJENA IZ SEMEN KRIŽNIC, SOJE, KORUZE IN DRUGIH OLJNIC

PRIMER OGRIOL (HLB OBIČAJNO SREDNJE NIZEK 5 -6)

LE MALO SLABŠE DELOVANJE PRI NIŽJIH TEMPERATURAH

UPORABNO KOT DODATEK PRI HERBICIDIH PREDVSEM ZA ŠIROKOLISTNE PLEVELE (NPR. HERBICIDI V SLADKORNI PESI)

DELNO RAZTAPLJAJO POVRHNJICO PLEVELA

NI VELIKEGA UČINKA POVEČEVANJA KAPLJIC, ČE NI DRUGIH DODATKOV

V KOMBINACIJI Z LECITINOM JE LAHKO ANTIDRIFTNI UČINEK

V KOMBINACIJI Z LECITINOM JE DOBRO ZA LIPOFILNE IN HIDROFILNE HERBICIDE
NISO PRIMERNI ZA MEŠANJE Z WDG FORMULACIJAMI

DOBRO SE KOMBINIRAJO S SILIKONSKIMI MOČILI
NAVADNO NE UPORABLJAMO S SULFONILSEČNINSKIMI HERBICIDI

MVOC – PENETRANTI IN ADHEZIVI (METILATED OIL CONCENTRATE) METILIRANA ZAESTRENA RASTLINSKA OLJA + OMOČILO OBIČAJNO NEIONSKO

PRIMER DASH- vmesna kategorija, GONDOR – kombinacija s sojinim lecitinom, MERO (metil ester ogrščič. olje), HASTEN (zaestreno rastlinsko ogrščično in koruzno olje)

HLB OBIČAJNO NEKOLIKO VIŠJI (10-12) OD VOC ZARADI UČINKA METILIRANJA
DELUJEJO ENAKO DOBRO PRI NIŽJIH IN VIŠJIH TEMPERATURAH

UPORABNO KOT DODATEK PRI HERBICIDIH ZA TRAVE IN ZA ŠIROKOLISTNE PLEVELE
TI DODATKI SO UPORABNI PRI MOČNEM SUŠNEM STRESU PLEVELOV (ZAPRTE REŽE IN ODEBELJENA POVRHNJICA)

ZARADI MOČNEGA RAZTAPLJANJA POVRHNJICE SE LAHKO POVEČA FITOTOKSIČNOST ZA GOJENO RASTLINO
PRIMERNI ZA PLEVELE, KI IMAJO GOSTE DLAČICE

HSOC - **High surfactant oil concentrates – ZA HKRATNO UPORABO LIPOFILNIH HERBICIDOV Z GLIFOSATNIMI HERBICIDI**
POLOVICA MVOC ALI VOC IN POLOVICA NEIONSKEGA MOČILA
NA PRIMER ZA MEŠANICE RAZLIČNIH SULFONILSEČNIN ALI MEŠANICE SULFONILSEČNIN S HORMONCI ALI TRIAZINI

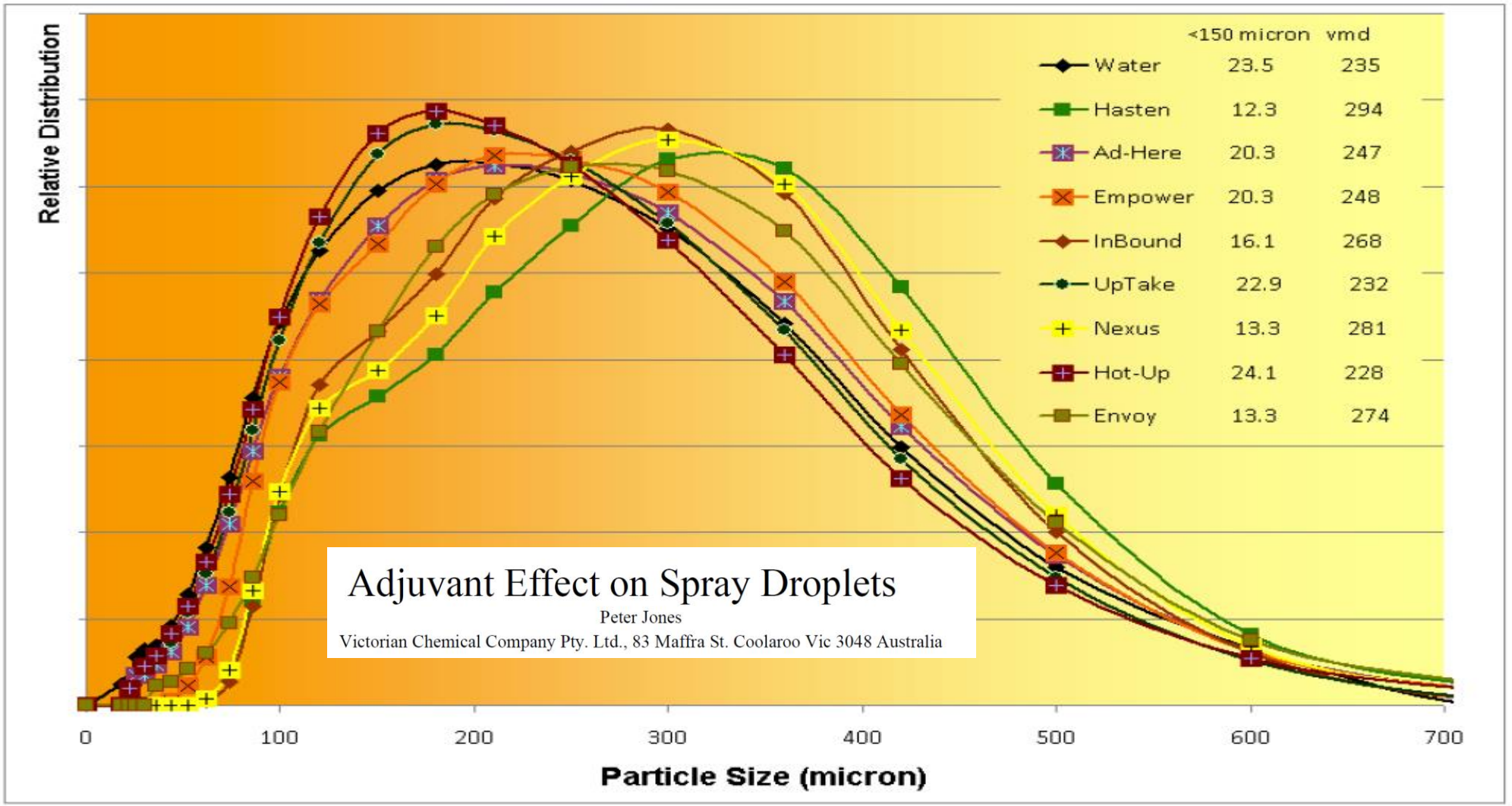
Olja povečujejo kapljice, glej na primer Water proti Hasten (oljni dodatek)

Adjuvant Effect on Spray Droplets

Peter Jones
Victorian Chemical Company Pty. Ltd., 83 Maffra St. Coolaroo Vic 3048 Australia

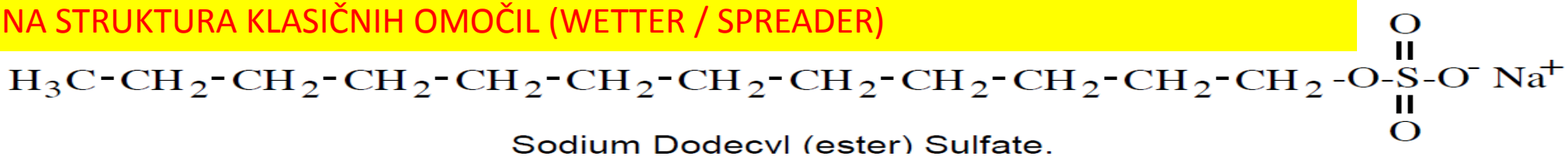
VICTORIAN CHEMICALS

FIGURE 4: Particle Size distribution for oil based adjuvants in water through XR11002 nozzle at 2.5 bar

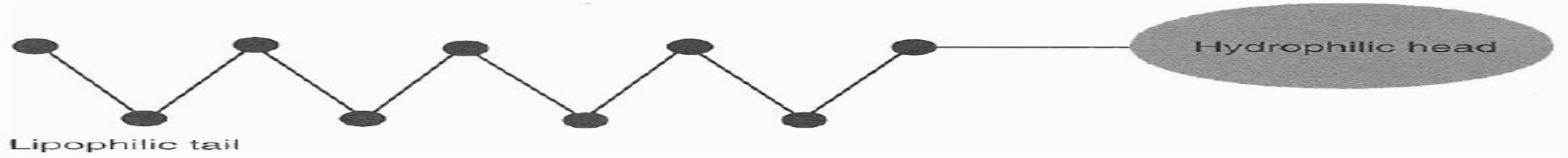


The polar portion exhibits an strong affinity for polar solvents, particularly water, and it is often called **hydrophilic** part or **hydrophile.** The apolar part is called **hydrophobe** or **lipophile**, from Greek roots ***phobos*** (fear) and ***lipos*** (grease). The following formula shows an amphiphilic molecule which is commonly used in shapoos (sodium dodecyl sulfate).

SPLOŠNA STRUKTURA KLASIČNIH OMOČIL (WETTER / SPREADER)



Sodium Dodecyl (ester) Sulfate.



Nepolarno v vodi netopno, topno v maščobi

OBIČAJNO NEPOLAREN REP SESTAVLJAJO

Dolge ogljikove verige alkilnega ali alkilbenzenskega tipa

Polarno v vodi topno

POLARNO GLAVO SESTAVLJAJO

etri, estri, tioli, alkoholi,
sulfati, sulfonati, fosfati,
amini, amidi

33 % Soaps, carboxylates, lignosulfonates:
50 % soaps for domestic use.
35 % other acids for industrial use.
22 % Synthetic Detergents, mostly sulfonates or sulfates:
50 % domestic use (powder, liquid).
17 % petroleum industry.
7 % concrete additives.
4 % agro and food processing.
3 % cosmetics and pharmaceuticals.
40 % Nonionics (mostly ethoxylated) or ethoxysulfates:
40 % ethoxylated alcohols.
20 % ethoxylated alkylphénols (in fast regression)
15 % fatty acid esters.
10 % amine or amide derivatives.
4 % Cationics, mostly quaternary ammoniums.
1 % Amphoterics, mostly betaines and amino acid derivatives.

KLASIFIKACIJA SURFAKTANTOV

Surfaktanti (surface-active-agent) so molekule, ki so aktivne na molekularni meji raztopin iz polarnih in nepolarnih molekul. Molekula je sestavljena iz relativno dolgega repa NEPOLARNE narave in krajše glave POLARNE narave (IZ RAZLIČNIH KOMBINACIJ REPOV IN GLAV DOBIMO TISOČE SPOJIN).

Glede na skupni površinski naboj ločimo anionske, kationske, neionske (nonionic) in amfoterne (amphoteric ali zwitterionic).

Water Molecules at a surface

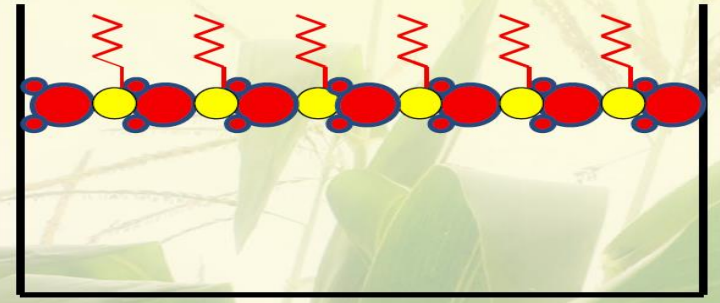
Water molecules at a surface have forces of attraction that are stronger than those below the surface



Kemo-fizikalni princip surfaktantnega delovanja za zmanjševanje površinske napetosti tekočine kot je voda

"Surface Seeking" Effect of Surfactant Molecules

Surfactant molecules disrupt surface forces and reduce surface tension



Water Molecules at the Surface of a Droplet

Surface Tension of pure water is 72 dynes / cm @ 25°C.



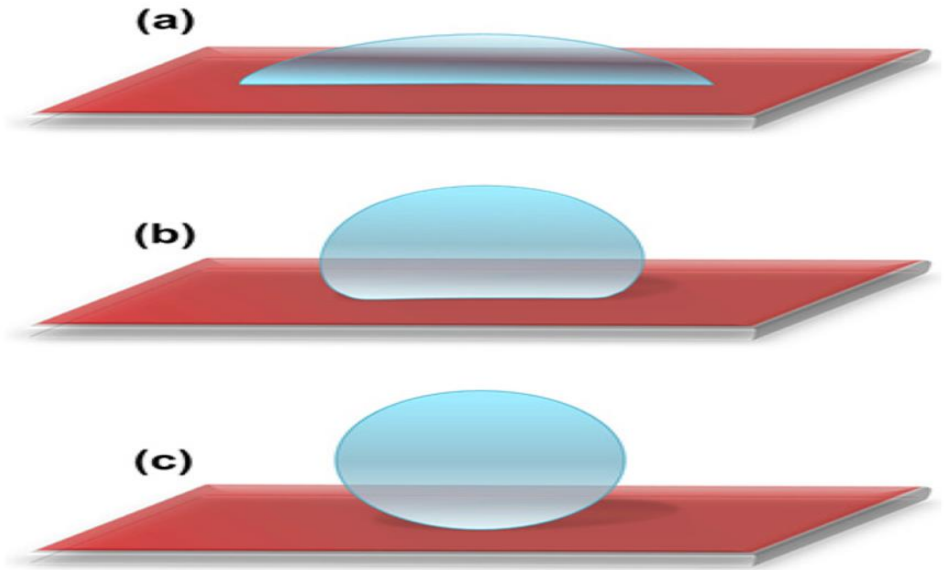
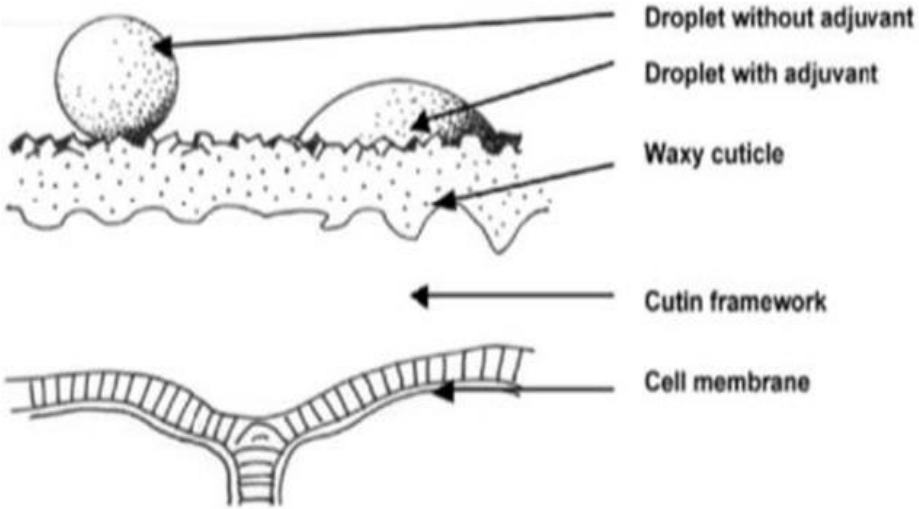


Figure 1. A schematic showing (**a**) hydrophilic surface with water contact angle less than 90°; (**b**) hydrophobic surface with water contact angle greater than 90° and (**c**) superhydrophobic surface with water contact angle larger than 150°.



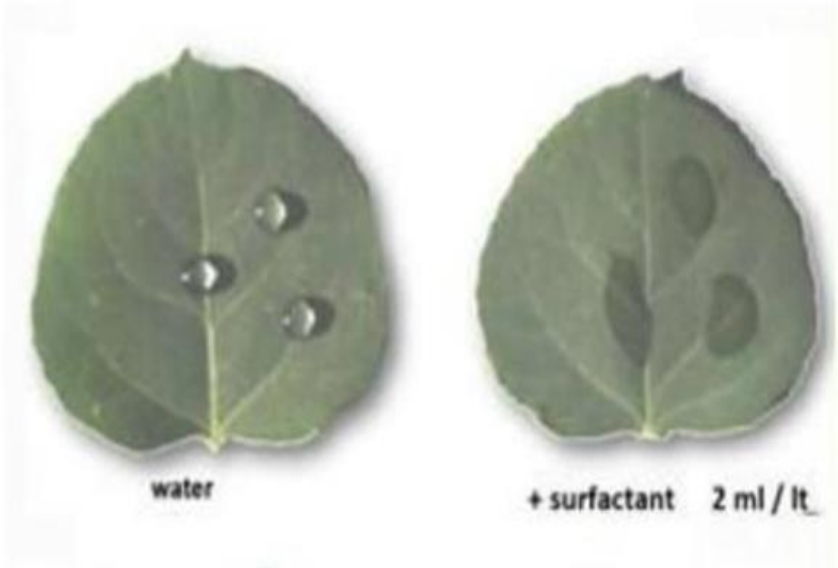
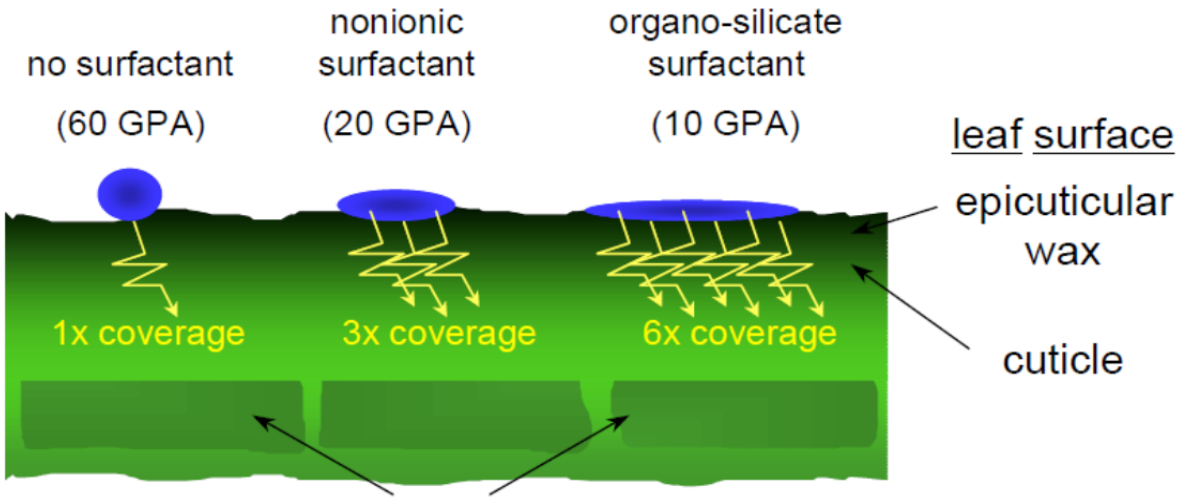


Figure 1: Impact of adjuvants on a leaf surface. Source: SACOA

Primerjava obsega razlivanja kapljice, velikosti stične površine in obsega prehajanja aktivne snovi pri različnih močilih.



Epidermal cells (where photosynthesis, cell disruption, growth inhibition, contact, or amino acid herbicides are most effective).

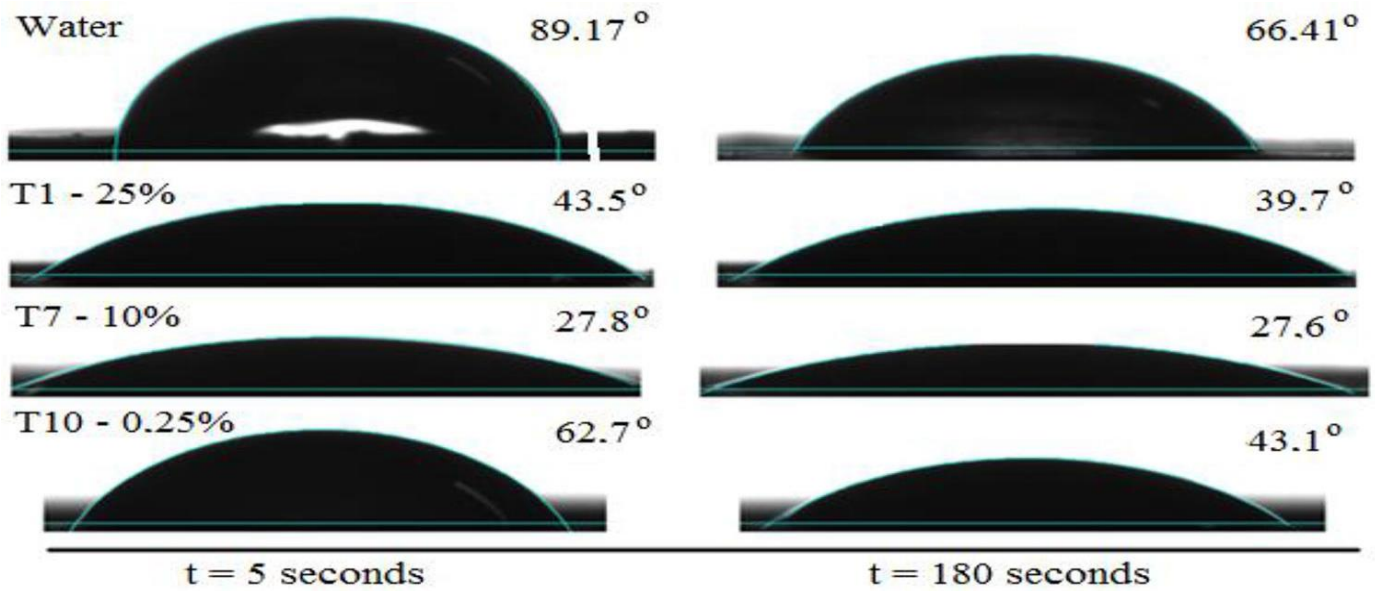
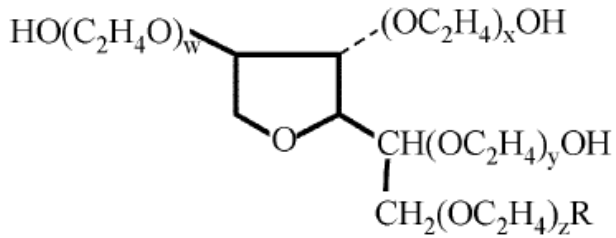
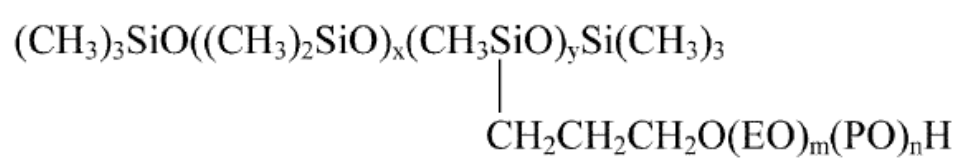


Table 2 Surfactant classifications

Class	Examples	Structures
Anionic		
	Na stearate	$CH_3(CH_2)_{16}COO^-Na^+$
	Na dodecyl sulfate	$CH_3(CH_2)_{11}SO_4^-Na^+$
	Na dodecyl benzene sulfonate	$CH_3(CH_2)_{11}C_6H_4SO_3^-Na^+$
Cationic		
	Laurylamine hydrochloride	$CH_3(CH_2)_{11}NH_3^+Cl^-$
	Trimethyl dodecylammonium chloride	$C_{12}H_{25}N^+(CH_3)_3Cl^-$
	Cetyl trimethylammonium bromide	$CH_3(CH_2)_{15}N^+(CH_3)_3Br^-$
Non-ionic		
	Polyoxyethylene alcohol	$C_nH_{2n+1}(OCH_2CH_2)_mOH$
	Alkylphenol ethoxylate	$C_9H_{19}–C_6H_4–(OCH_2CH_2)_nOH$
	Polysorbate 80 $w + x + y + z = 20$ $R = (C_{17}H_{33})COO$	
	Propylene oxide-modified polymethylsiloxane (EO = ethyleneoxy, PO = propyleneoxy)	
Zwitterionic	Dodecyl betaine	$C_{12}H_{25}N^+(CH_3)_2CH_2COO^-$
	Lauramidopropyl betaine	$C_{11}H_{23}CONH(CH_2)_3N^+(CH_3)_2CH_2COO^-$
	Cocoamido-2-hydroxypropyl sulfobetaine	$C_nH_{2n+1}CONH(CH_2)_3N^+(CH_3)_2CH_2CH(OH)CH_2SO_3^-$

ANIONSKA OMOČILA (pogosto le običajni detergenti)

PRIMER NEKATERA TWIN MOČILA

UPORABI V HLADNEM IN PRI MEHKI VODI (KOT UNIVERZALNI SULFONATNI DETERGENTI IN MILA)
LAHKO POVZROČAJO MOČNO PENJENJE BROZGE

UPORABNI PREDVSEM ZA PRIPRAVO SUSPENZIJSKIH HERBICIDOV (WP)
SE NE DODAJAJO HERBICIDOM, KI SO V KATIONSKEM STANJU (NPR. BIPIRIDILI)

SE DODAJA HERBICIDOM, KI SO V OBLIKI SOLI IN ŠIBKIH KISLIN (conditioner efekt)
NIMAJO ZELO VELIKEGA VPLIVA NA OBLIKOVANJE OBLOGE HERBICIDA IMAJO PA ZMEREN ADHEZIVNI UČINEK (NA PRIMER PRI TRAVAH)

KATIONSKA OMOČILA (praktično ni v prodaji)

PRIMER DUŠIKOVE AMONIJSKE SPOJINE ZA FORMULIRANJE GLIFOSATNIH PRIPRAVKOV

ETOKSILIRANI MAŠČOBNI AMINI
PRI POVEČANEM ODMERKU SO ZELO HITRO FITOTOKSIČNI ZA RASTLINE
ZELO NEVARNI ZA VODNE ORGANIZME
LAHKO IMAJO VELIK HUMEKTANTNI UČINEK

NEIONSKA OMOČILA (najbolj pogosta uporaba in najmanjša tveganja pri uporabi)

PRIMER TREND, CITOWETT, PINOVIT, EXTRAVON (HLB OBIČAJNO NAD 10)

TO SO ETOKSILATI, PROPIKSILATI IN BUTOKSILATI ALKOHOLOV, ALKILAMINOV IN ALKILFENOLOV (HITRO SUŠENJE KAPLJIC)

ČE JE DODAN GLIKOL JE SUŠENJE POČASNEJŠE

SE DODAJAJO HERBICIDOM, KI SO V KATIONSKEM STANJU (NPR. BIPIRIDILI)
SO ZELO UPORABNI KOT DODATEK HERBICIDOM, KI DELUJEJO KOT ŠIBKE KISLINE IN POVEČAJO NJIHOVO ADAPTABILNOST ZA VARIRANJE HIDROFILNO – LIPOFILNEGA ZNAČAJA

NEKOLIKO ZMANJŠUJEJO VELIKOST KAPLJIC IN POVEČUJEJO DRIFT (DODATEK GLIKOLA TO OMILI)
NE POVEČUJEJO OČITNO DIREKTNO PREHAJANJE HERBICIDA V NOTRANJOST RASTLINE

SO NEKOLIKO SALBŠI PRI NEKATERIH LIPOFILNIH HERBICIDIH (NPR. IMIDAZOLINONI)

AMFOTERIČNA OMOČILA
PODOBNE LASTNOSTI KOT NEIONSKA OMOČILA (primer pri nas so lecitinska omočila, ki delujejo tudi delno znotraj rastline)

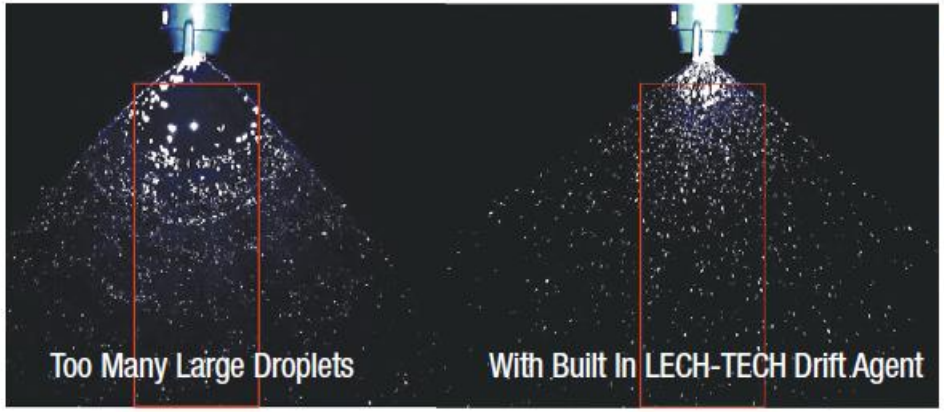
Primer lecitinskega omočila na SLO trgu

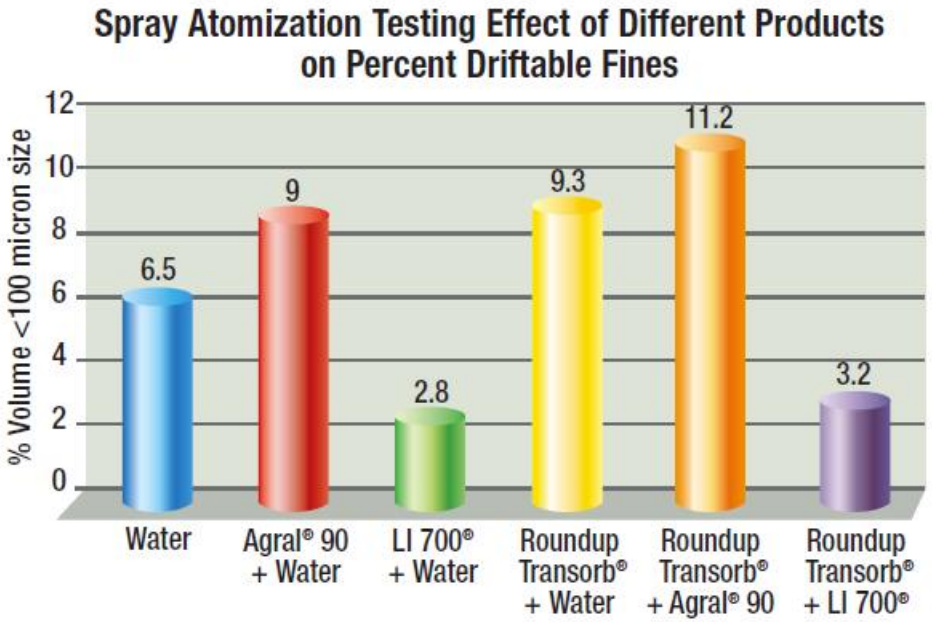
- **Učinkovina: sojin lecitin 488 g/L**
  Formulacija: koncentrirana emulzija (EC)
  Karenca: upoštevamo karenco dodanega FFS
  Reakcija (pH): 5-6 kislo do slabo kisla
  Proizvaja: DE SANGOSSE , Francija.
  Embalaža: 250 mL, 1 L

- GONDOR® je proizveden na osnovi sojinega lecitina, ki je formuliran skupaj z metil estri rastlinskih olj. Ta sestava ga uvršča med ekološko zelo sprejemljiva sredstva. Močilo GONDOR® omogoča hitrejši vstop (penetracijo) škropilne brozge v rastlino, kajti lecitin začasno razrahlja vezi v kutikuli na listni površini, vendar pa je ne poškoduje, kot ostala močila. Hitrejša je tudi translokacija oz. prenos učinkovin po rastlini. Zaradi hitrega vstopa smo tudi manj odvisni od vremenskih vplivov. Lecitin, kot zelo zmogljiv emulgator, pomembno prispeva k izboljšanju fizične združljivosti (mešanju) različnih fitofarmacevtskih sredstev in foliarnih gnojil tako v škropilnici kot na rastlini. Število zelo drobnih kapljic (megla) se zelo zmanjša, s tem zelo omejimo zanos škropiva na neciljne površine oz. rastline, s tem pa je tudi izguba škropilne brozge manjša in učinkovitost boljša. Ob tem močilo GONDOR® zelo izenači velikost kapljic, kar pomembno prispeva k enakomernemu nanosu škropiva na rastlino. GONDOR® močno zmanjša površinsko napetost na listu, kar bistveno zmanjša odtekanje škropilne brozge iz zelenih delov rastlin. Zaradi manjših izgub je lahko tudi poraba vode manjša. Priporoča se v kombinaciji s FFS in foliarnimi gnojili, predvsem pri tretiranje poljedelskih površin z glifosatnimi herbicidi in regulatorji rasti.

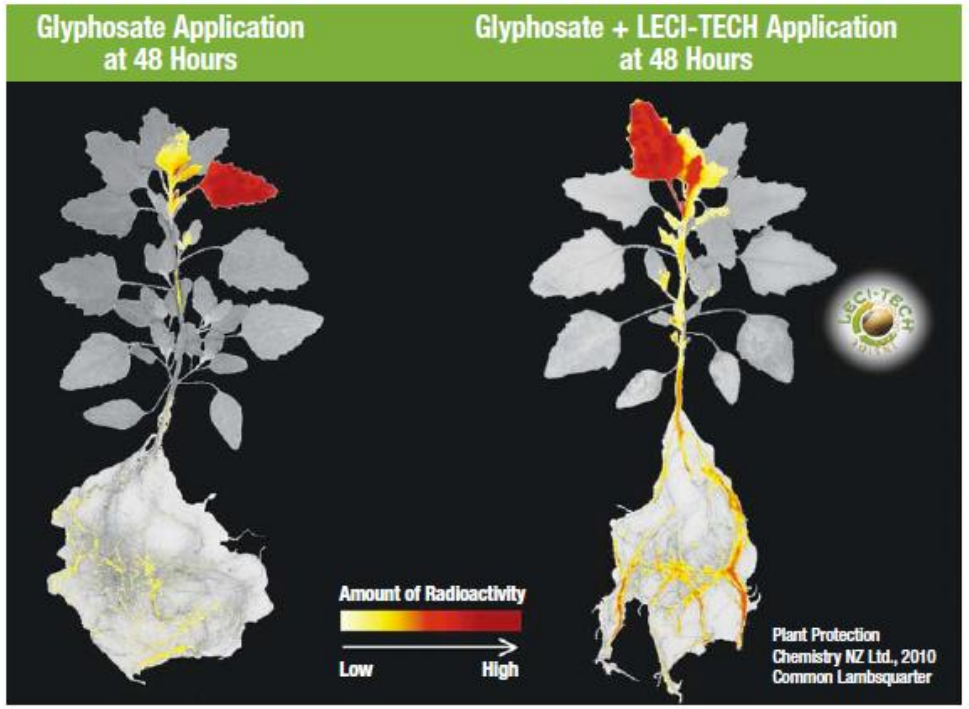
- **Uporaba:** GONDOR® se lahko uporabi v največji dovoljeni **koncentraciji 0,25 %** v škropilni raztopini v vseh kulturah.

The result is more right-sized droplets, which avoid the problem of having small droplets that drift and large droplets that bounce off the plant surface. LI 700 also increases the velocity of spray droplets – this momentum makes droplets even less likely to drift. *In fact, LI 700 is labeled for lowering the potential for off-target spray.*





Source:
Thomas M. Wolf and Brian C. Caldwell, Agriculture and Agri-Food Canada, Saskatoon Research Centre, April 2001

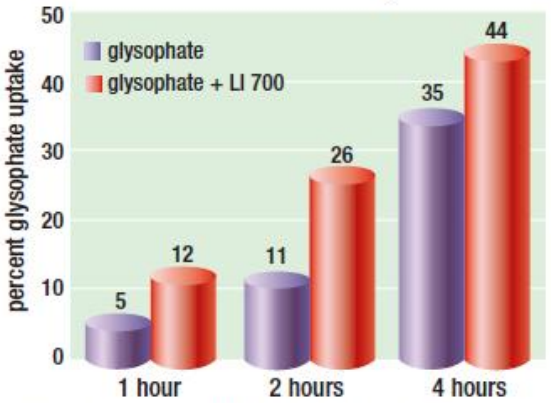


The LECI-TECH Family of Products

PRODUCT	Acidifier	Defoam	Deposition Aid	Drift Control	Penetrant	Spreader/ Sticket
LI 700	●		●	●	●	●
Liberate			●	●	●	●
VALID		●	●	●		
MSO CONCENTRATE			●	●	●	●

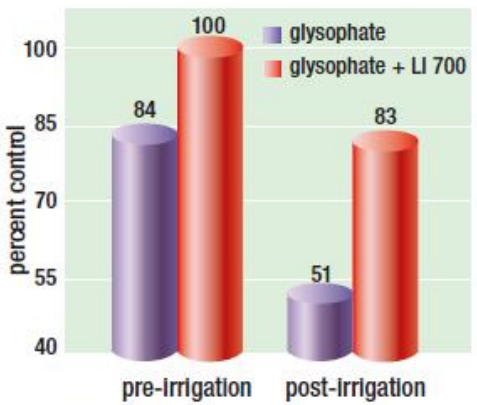
Faster Uptake of Glyphosate

LI 700 increases Glysophate Uptake on 3 to 4 Week Old Lambsquarters



Source: Forest Research Institute, New Zealand

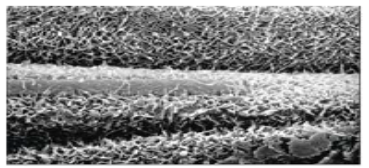
Rainfastness with Glyphosate



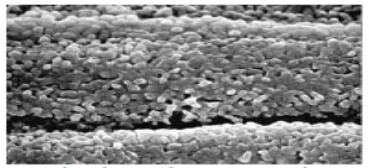
Source: Oxford Research Group, UK

Problem: Crop and environmental safety
Solution: LI 700 is based on a naturally derived soybean product

Crop producers want products that are safe on their crop and the environment. LI 700 incorporates LECI-TECH technology – a patented, lecithin-based surfactant technology derived from soybeans, which is an environmentally friendly alternative to petroleum-based products. This technology also allows spray droplets to reach the critical micelle concentration (CMC) – the point at which maximum surface depression (spreading) is achieved – at a lower use rate than conventional surfactants. The result is less disruption on the plant surface, further contributing to improved crop safety.



Normal undisturbed structure



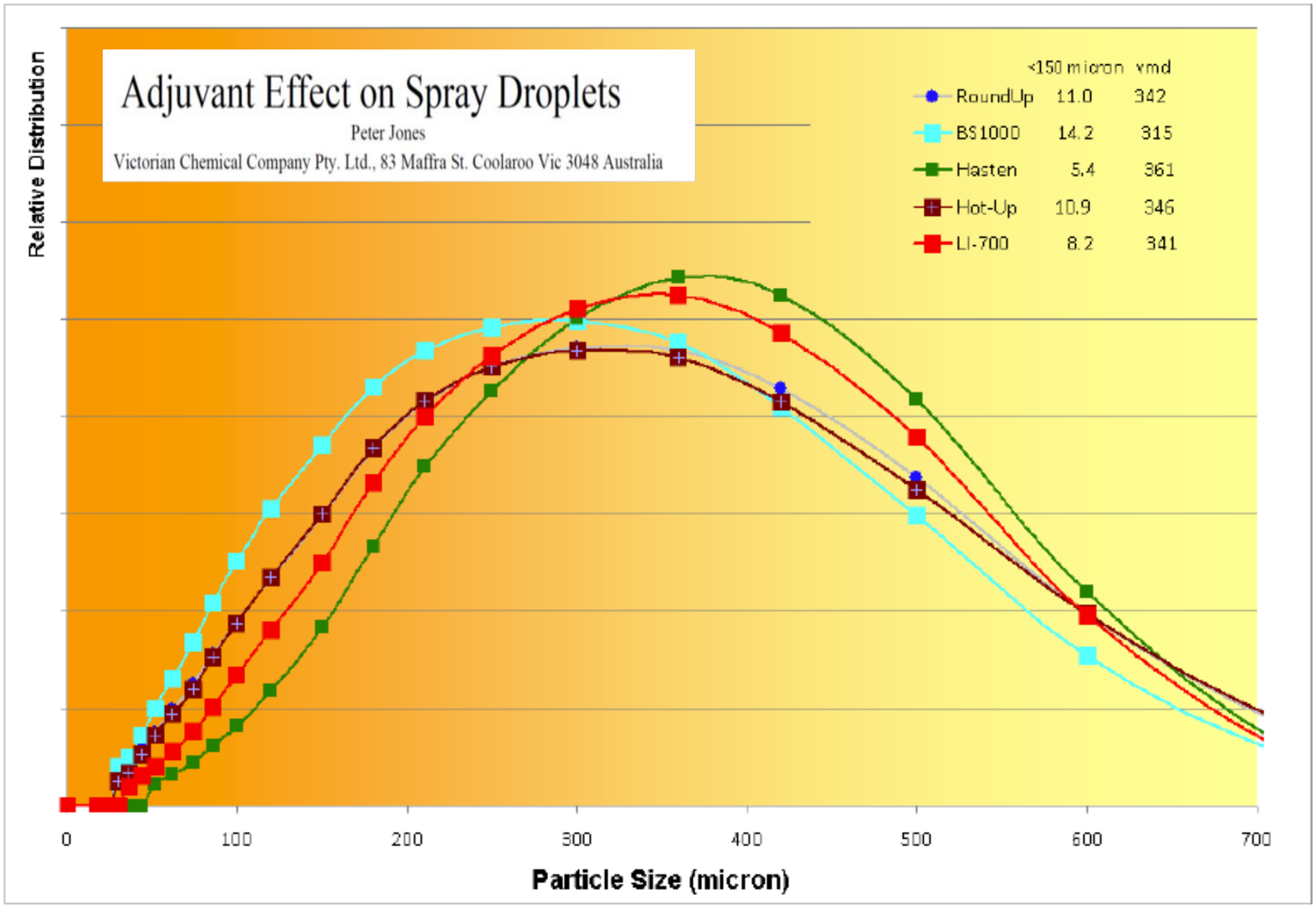
Structure after exposure to petroleum-based product

Problem: Pesticide solubility limits surfactant options
Solution: LI 700 works well with both water-soluble and oil-soluble pesticides

Pesticides are typically either oil or water-soluble, which limits the surfactants that they can be mixed with. With its combination of hydrophilic (water loving) and lipophilic (fat loving) elements, LI 700 is highly versatile. Its chemistry makes it effective in both water-soluble and oil-soluble pesticides.

Lecitinska omočila imajo vmesni učinek na povečevanje kapljic med olji in neionskimi močili (glej LI700)

FIGURE 5: Particle Size distribution for adjuvants with RoundUp CT (2.5%) through AIXR11002 nozzle at 5 bar pressure



AIXR11002 – Air Induction Flat Fan

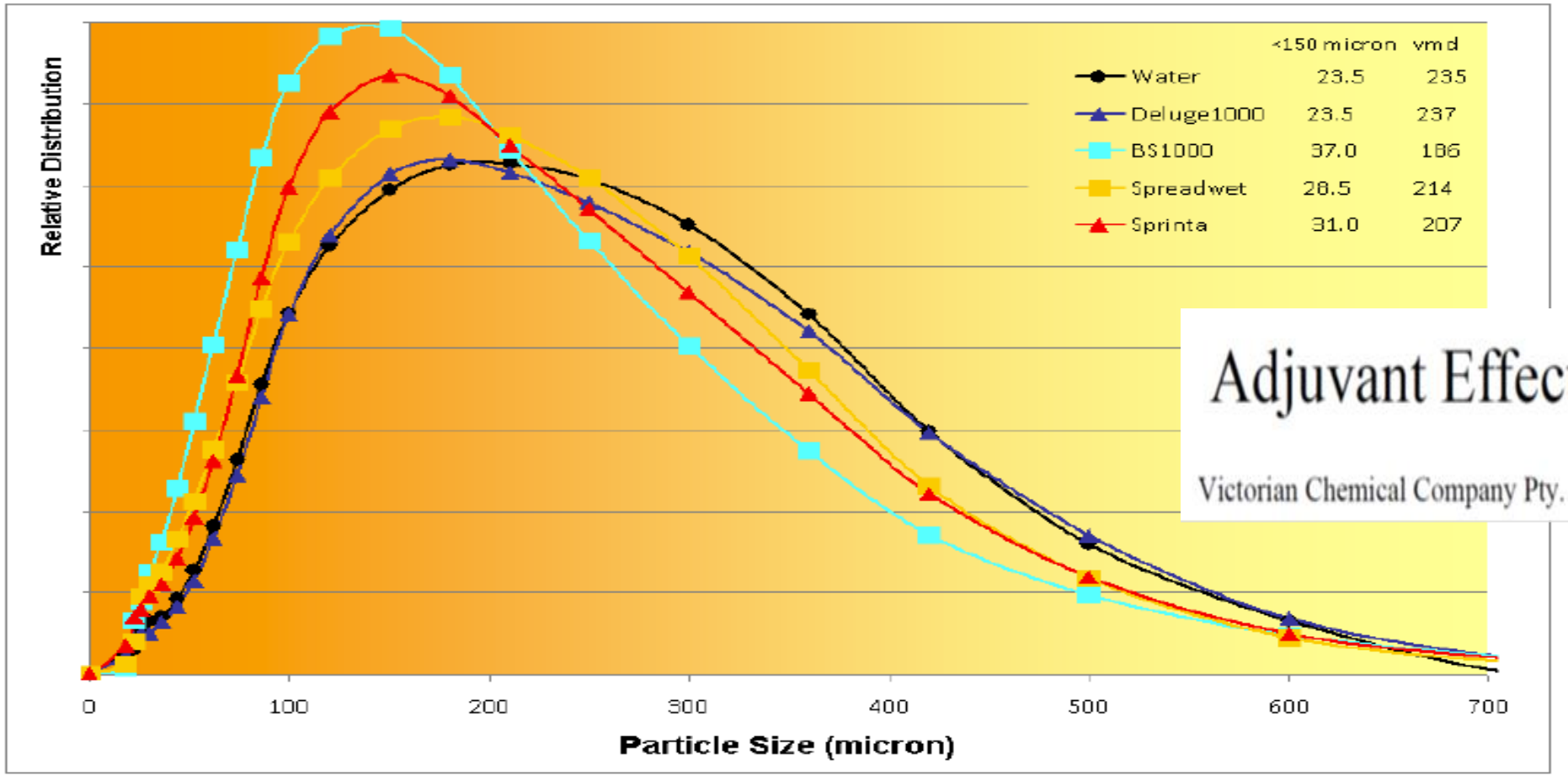
Whilst droplet size is much larger than for the equivalent size XR nozzle, the effect of the adjuvant is essentially the same. i.e. The results shown in Figure 5 show that wetting agents tended to reduce droplet size whilst oils based adjuvants increased droplet size. This effect is somewhat unexpected as the effect of air inclusion (essentially making a foam) would be expected to be promoted by wetting agents but suppressed by oils.

Wetting Agent Adjuvants in Water

NIS zmanjšujejo kapljice, glej na primer Water proti BS1000

This study (Figure 3) compared a group of nonionic wetting agents for their effect on droplet size. Details of the products are shown in Table 1 – note that this group of wetting agents encompasses essentially all of the common types of product available as wetting agents for Australian ag Most of the products tended to reduce the average droplet size or increase the proportion of smaller droplets. BS1000 tended to reduce droplet size most significantly whilst Deluge 1000 had the least effect of reducing droplet size.

FIGURE 3: Particle Size distribution for wetting agents in water through XR11002 nozzle at 2.5 bar pressure



Adjuvant Effect on Spray Droplets

Peter Jones

Victorian Chemical Company Pty. Ltd., 83 Maffra St. Coolaroo Vic 3048 Australia

SILIKONSKA OMOČILA (SPADAJO MED NEIONSKA OMOČILA)

PRIMER (SYLWETT, BREAK THRU, ETALFIX, …)

IZRAZITO ZMANJŠAJO POVRŠINSKO NAPETOST (VELIK SPREADING UČINEK)

ZELO POVEČAJO UČINEK KONTAKTNIH HERBICIDOV (tudi zunanje premeščanje na nepoškropljene dele)

VELIKO POVEČANJE VSTOPA SKOZI LISTNE REŽE

NISO NAJBOLJ PRIMERNI ZA KONTAKTNE HERBICDE, KI POTREBUJEJO MAJHNE VISOKOKONCENTRIRANE KAPLJICE (npr. piridat)

SO PRIPOROČLJIVA PRI UPORABI VELIKIH KAPLJIC IN SREDNJI PORABI VODE

NISO ZA ŠKROPLJENJE Z VELIKO PORABO VODE IN SREDNJE VELIKIMI DO VELIKIMI KAPLJICAMI

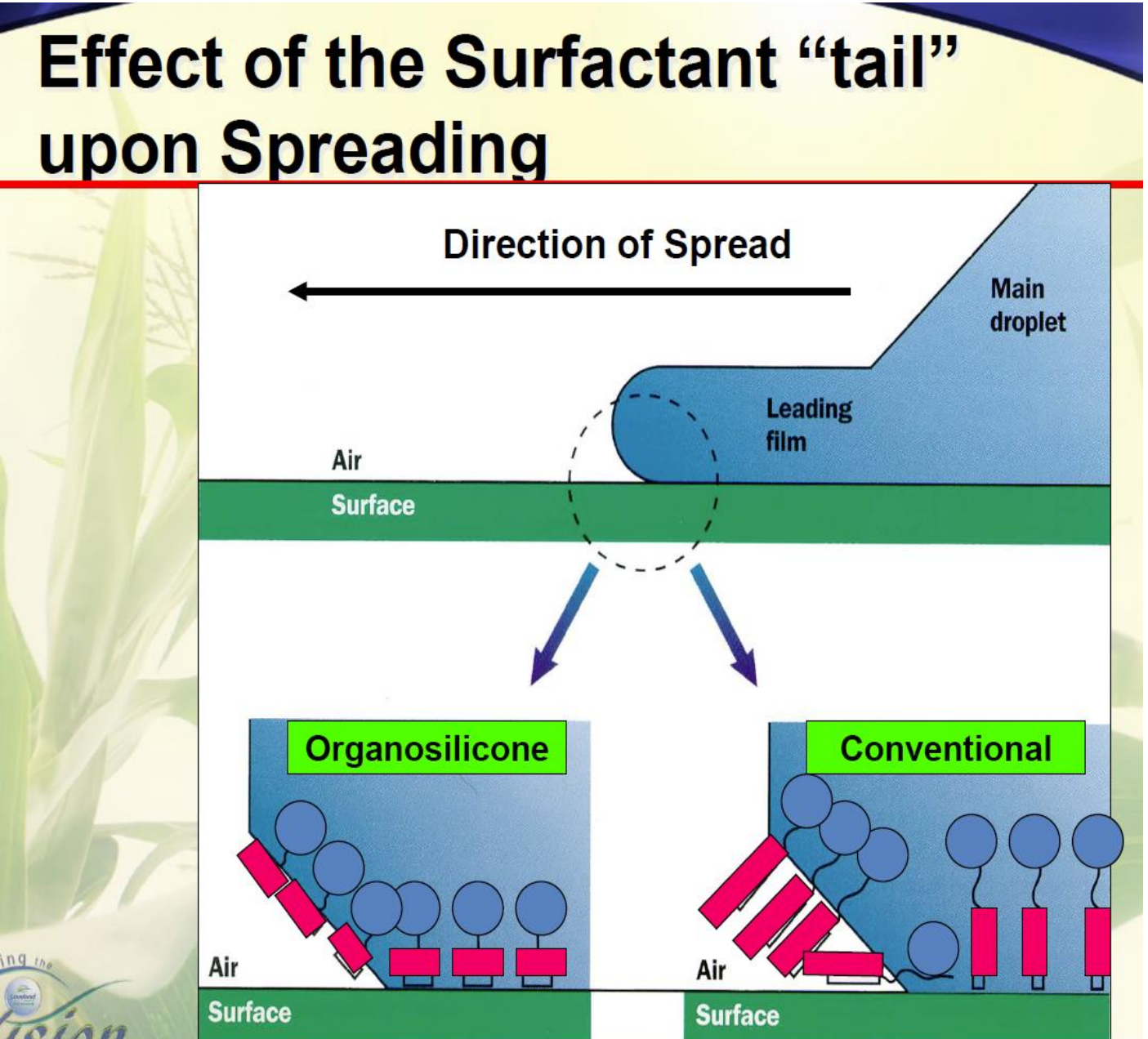
pH ŠKROPILNE BROZGE NE SME BITI IZVEN OBMOČJA 6 – 8 !!

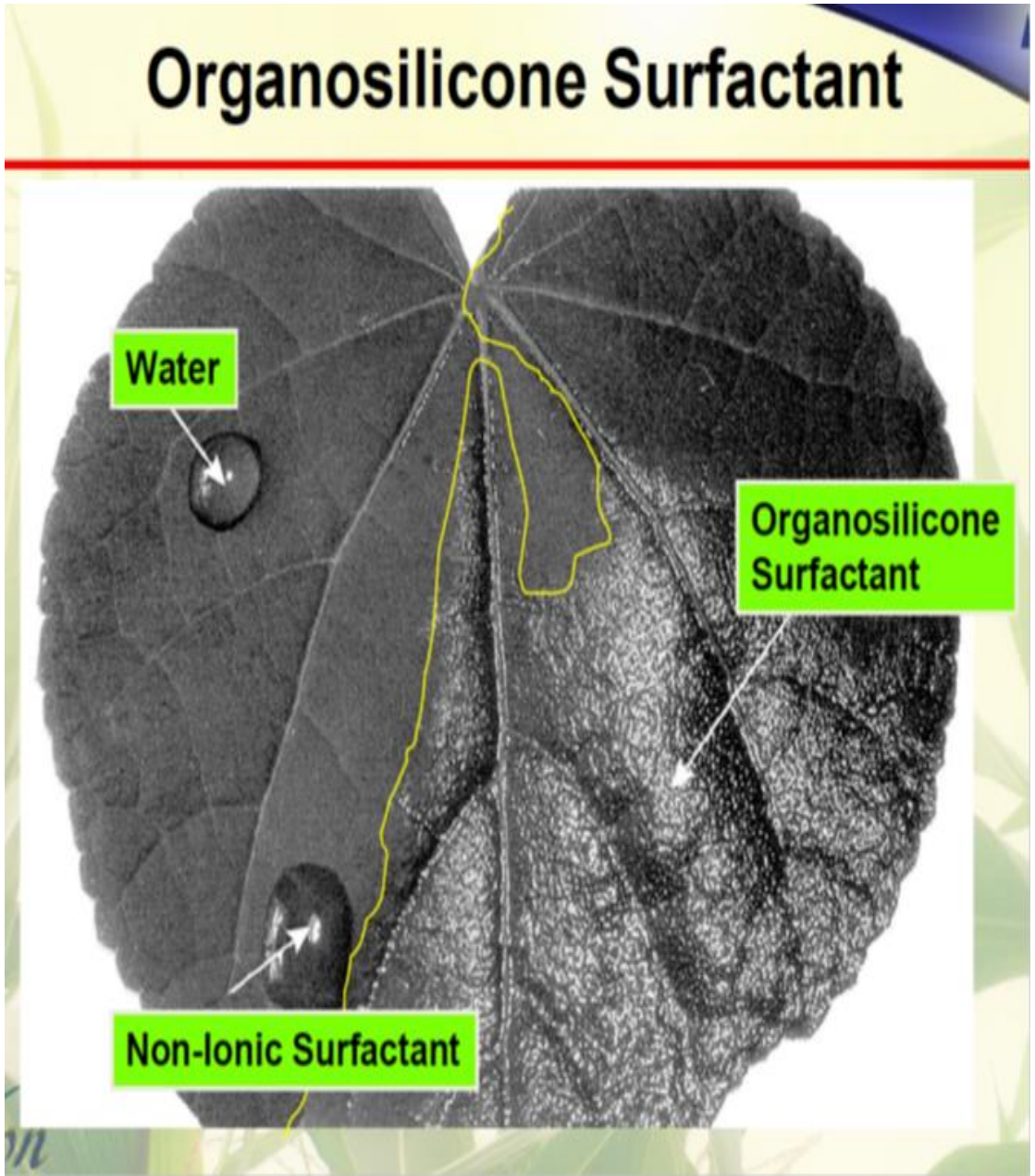
UPORABNA PRI ŠKROPLJENJU VELIKIH PLEVELOV IN V PRIMERU POJAVA DEŽNIK UČINKA

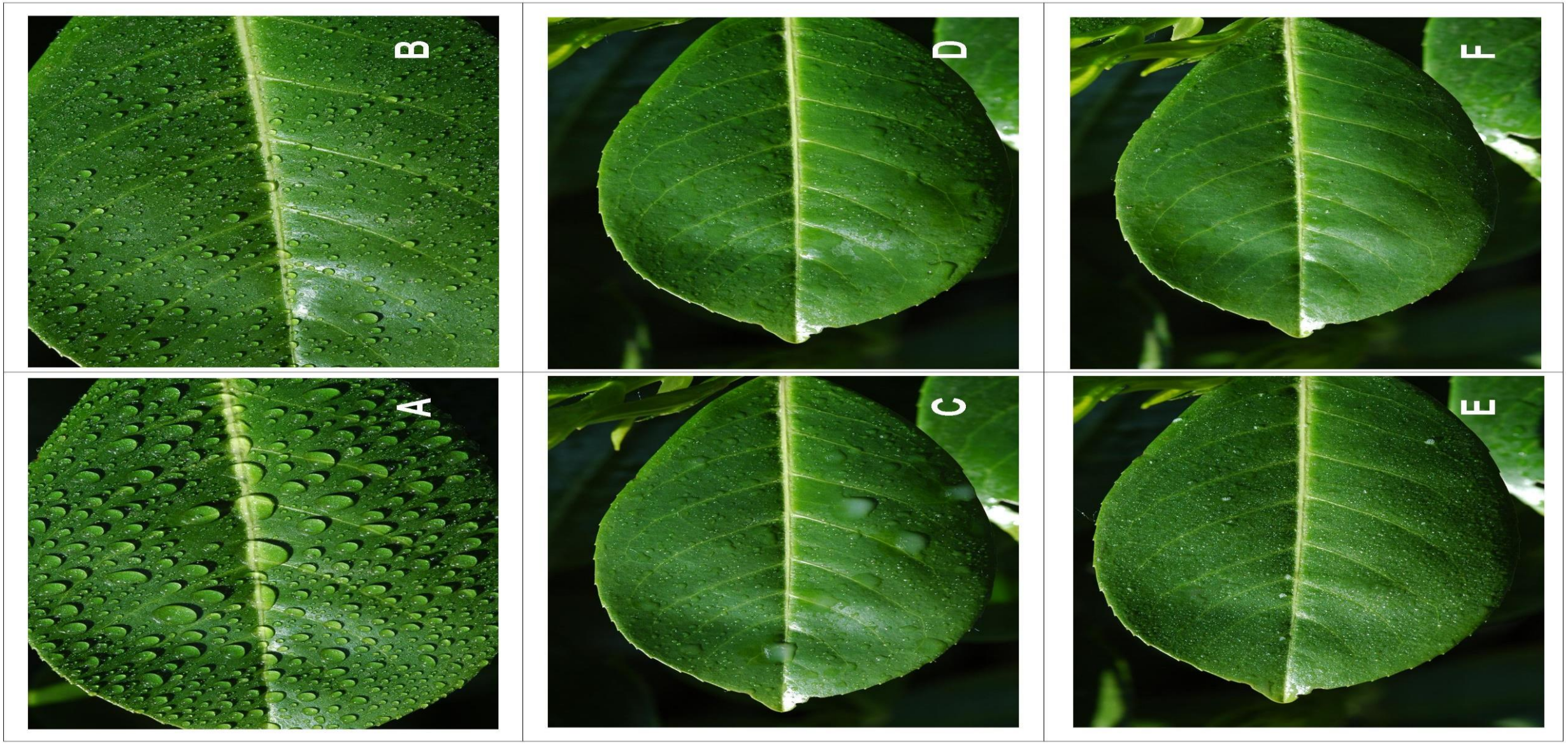
NE UPORABLJATI NA MOKRE RASTLINE

RAZLIKA V STOPNJI OMOČENJA MED NAVADNIM NEIONSKIM IN SILIKONSKIM NEIONSKIM OMOČILOM

Pri silikonskih močilih imajo robne molekule (rep) manjši upor za prilagajanje površini – tekočina se hitreje razleze



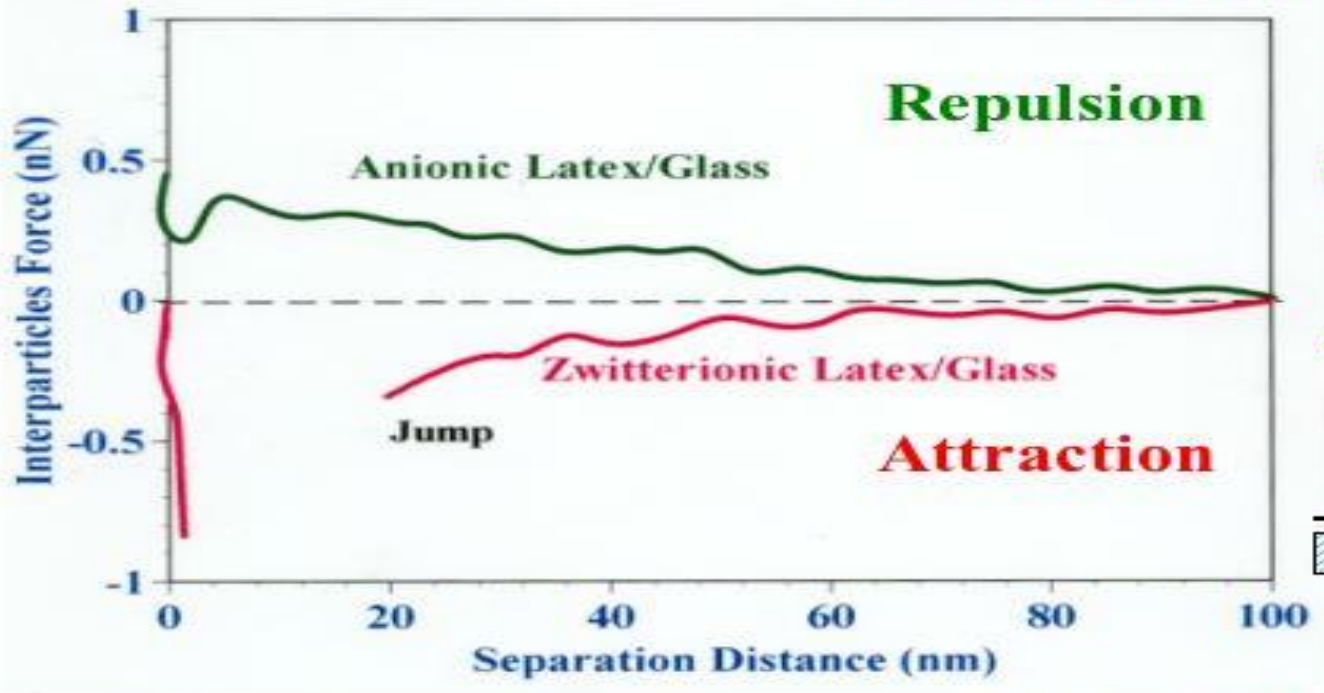


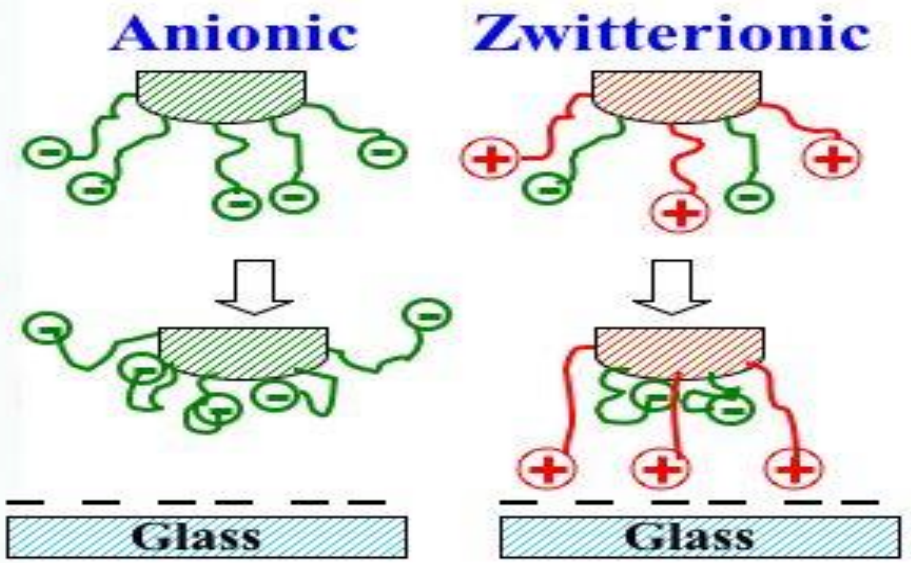


Slika 101: Primerjava strukture kapljic na listu pri nanosu škropilne brozge brez omočila (A – po 0,5 minute, B – po 10 minutah od nanosa), pri uporabi običajnega neionskega omočila (C – po 0,5 minute, D – po 5 minutah od nanosa) in pri uporabi silikonskega super spreaderja (E – po 0,5 minute, F – po 3 minutah od nanosa); **nanos brozge je bil opravljen na list postavljen poševno pod kotom 45o glede na smer gibanja kapljic,** pri 25 oC in 60-odstotni relativni zračni vlagi

Lateks močila s funkcijo STIKER – imajo zelo močno lepljenje na ciljne površine ne glede na naboj površine.
Dobro lepljenje tudi na negativno nabite površine.

AFM Measurements of Particle-Surface Interaction





- Note that anionic latex particles (of the same net negative zeta potential) experience only repulsion, whereas the zwitterionic latex particles experience an attraction.

PRIMER LATEX KATEGORIJE NA SLO TRGU

ADJUVANT
Sticman®
POUR BOUILLIES FONGICIDES ET INSECTICIDES

Super mouillant – Adhésif
Anti-rebond – rétenteur

LA PERFORMANCE AU SERVICE
DE LA **CULTURE RAISONNÉE**.

- **Učinkovina:** stirene butadien ko-polimer
  Formulacija: koncentrirana emulzija - olje v vodi (EW)
  Karenca: upoštevamo karenco dodanega FFS
  Reakcija (pH): 7-8 nevtralno do bazično
  Proizvaja: DE SANGOSSE , Francija.
  Embalaža: 100 mL, 1 L

- **Uporaba:** Sticman® :
  - izboljša nanos in obstojnost sredstva za varstvo rastlin
  - izboljša oprijemljivost kapljic na listni površini in s tem prepreči izpiranje škropilne brozge zaradi dežja ali namakanja z razpršilci
  - upočasni proces razpadanja škropiva in s tem podaljša delovanje kontaktnim fungicidom in kontaktnim insekticidom.
  STICMAN® se lahko uporabi v največji dovoljeni **koncentraciji 0,1 %** v škropilni raztopini v vseh kulturah, skupaj z vsemi registriranimi FFS in kontaktnimi fungicidi.

- **Priprava sredstva za uporabo:** strogo se držite zaporedja priprave škropilne brozge:
  1. Pred uporabo dobro pretresemo plastenko!
  2. Rezervoar škropilnice napolnimo do ¾ z vodo in vključimo mešanja
  3. Dodamo potrebno količino sredstva za varstvo rastlin
  4. Dolijemo vodo do potrebne količine
  5. Nato dodamo potrebno količino STICMAN-a
  6. Z mešanjem nadaljujemo do porabe škropilne brozge.

ADJUVANT
Sticman®

ALI PRIDELOVALEC LAHKO IMA DOVOLJ ZNANJA, DA SAM PRESODI USTREZNE KOMBINACIJE HERBICIDNIH PRIPRAVKOV IN DODATKOV????

NE NE NE NE NE NE

UPORABA HLB INDIKATORJA ????

V SLOVENIJI PODATKOV O HLB NE PODAJAMO IN JIH V PRAKSI NE UPORABLJAMO

USES

In the United States, the largest market for adjuvants will continue to be the result of specific recommendations found on EPA-registered pesticide labels. These labels create an instant market by wording such as, "... always add a nonionic surfactant ..." or "... always add a crop oil concentrate ...." Many times, not only is a type of adjuvant recommended, a use rate is recommended as well. Also, specific information on the quality/composition of the adjuvant is given. These same EPA pesticide labels can also limit specific adjuvant use via specific recommendations such as, "... do not add any adjuvant containing surfactant or buffering properties ...," or can prohibit any adjuvant use by simply stating, "... do not add any adjuvants or surfactants to this product ..." (Anonymous 1999). Because it is a violation of federal law to use any pesticide in any manner inconsistent with its labeling, it is obvious that those

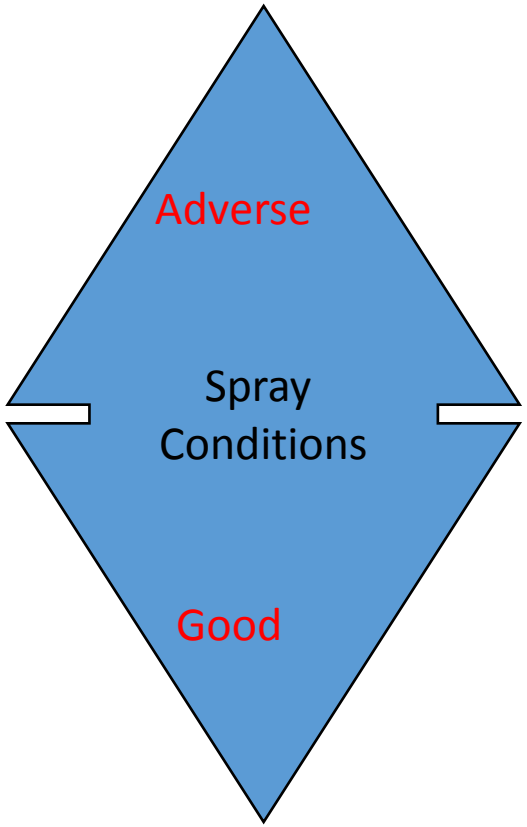
Herbicide (Examples of common brands)	Box 4. Recommended* adjuvant *types*, for the herbicides listed in this handbook
2,4-D (many brands)	Most brands recommend adding a nonionic surfactant; may be mixed with a nitrogen fertilizer or crop oil concentrate
Clopyralid (Transline®, Stinger®)	Nonionic surfactant
Fluazifop-p-butyl (Fusilade DX®)	Nonionic surfactant or crop oil concentrate
Fosamine ammonium (Krenite S®)	Oil-based surfactant suggested
Glyphosate (RoundUp Original®)	Adjuvants already added; nonionic surfactant or ammonium sulfate may also be added
Glyphosate (RoundUp Ultra®)	Adjuvants already added; ammonium sulfate may also be added
Glyphosate (Rodeo®, Aquamaster®, Glypro®)	Nonionic surfactant
Hexazinone (Velpar L®)	No recommendations on label
Imazapic (Plateau®)	Methylated seed oil or crop oil concentrate; nonionic surfactant; silicone-based surfactant; fertilizer-surfactant blends
Imazapyr (Arsenal®)	Methylated seed oil or crop oil concentrate; nonionic surfactant; silicone-based surfactant; fertilizer-surfactant blends
Picloram (Tordon K®, Tordon 22K®)	Nonionic surfactant
Sethoxydim (Poast®, PoastPlus®)	Methylated seed oil or crop oil concentrate; urea ammonium nitrate or ammonium sulfate (not recommended in Pacific Northwest, not allowed in California)
Sethoxydim (Vantage®)	Adjuvants already added, none needed
Triclopyr (Garlon 3A®, Garlon 4®)	Nonionic surfactant

*Recommended from herbicide labels. Be sure to always follow the label instructions for specifics on choosing and mixing herbicides and adjuvants.

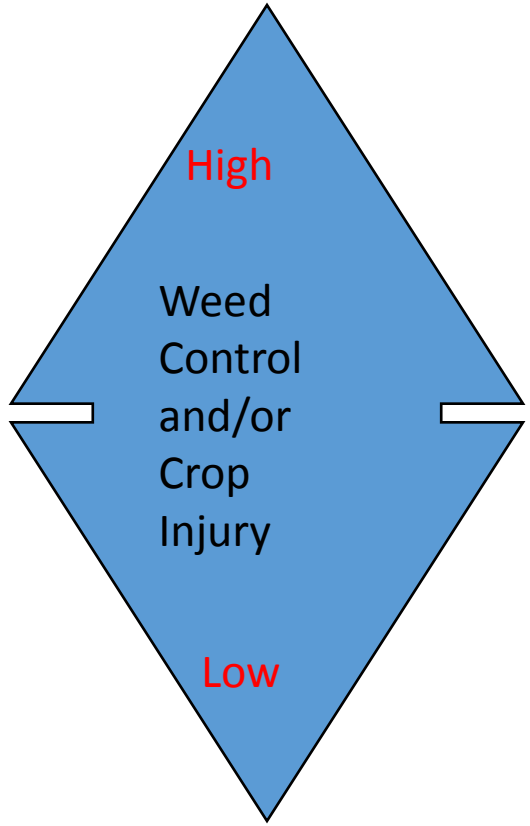
Ponekod v strokovni literaturi podajajo spiske kombinacij ustreznih dodatkov in posameznih vrst herbicidov.

NASVETI V ZDA (vreme in fitotoksičnost)

Selecting the Best Adjuvant or Adjuvant Combinations



Oils and Fertilizers
Methylated Seed Oils
Crop Oil Concentrates
Surfactants and Fertilizers
Nitrogen Fertilizers
Silicone Surfactants
Non-Ionic Surfactants

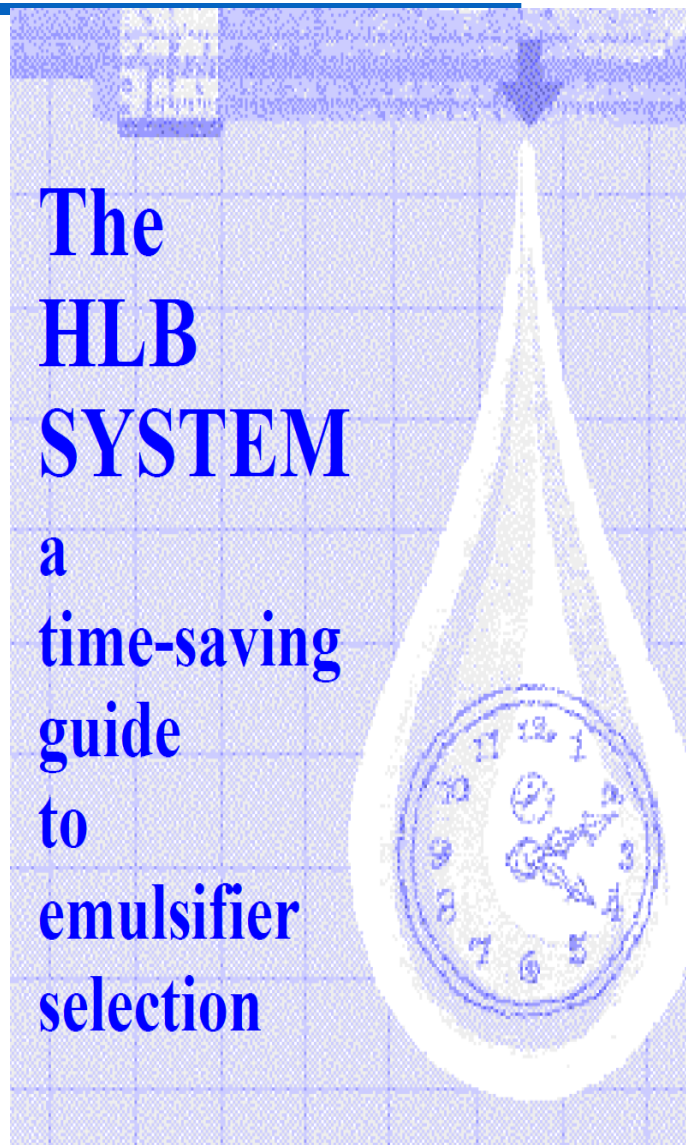


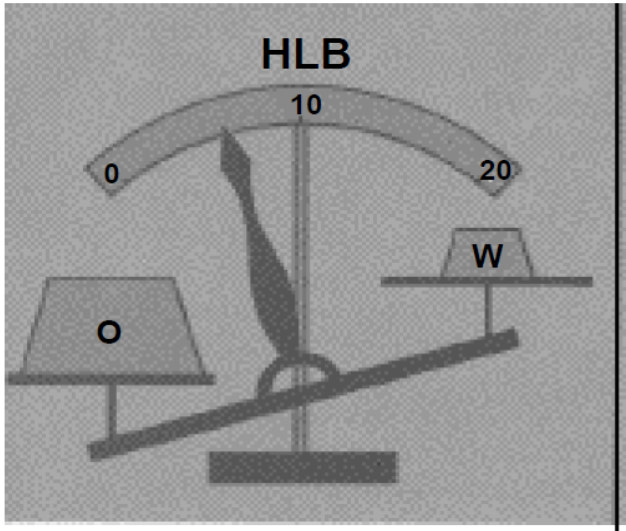
HLB – HIDROFILNO / LIPOFILNO RAZMERJE

(Hydrophilic:Lipophilic Balance)

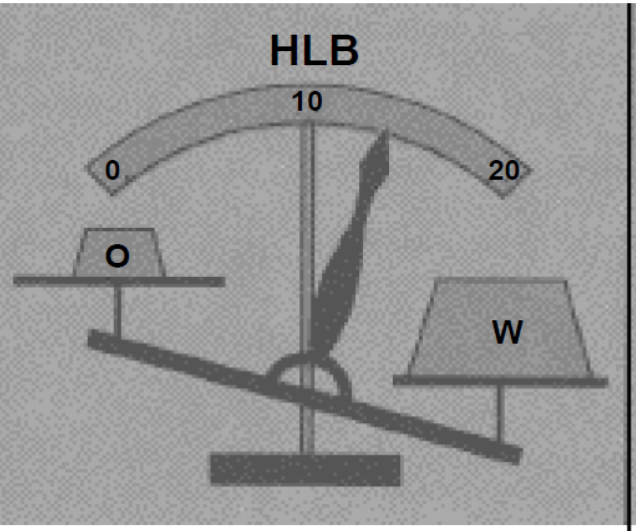
- **HLB is the relationship between the nature of the hydrophilic and lipophilic portions of the surfactant molecule. The range of HLB is 1-20. The higher the value the more hydrophilic the surfactant. Most effective surfactants have a value between 10-18. The HLB is not measured, it is calculated. Research has shown that there is significant herbicide/HLB/weed interactions.**

- **HLB DAJE INFORMACIJO O TEM, KATERA KOMPONENTA (REP ALI GLAVA) IMA VEČJI VPLIV NA FIZIKALNO-KEMIČNI KARAKTER RAZTOPINE HERBICIDA IN TO DAJE PODATEK O VEČJI ALI MANJŠI USTREZNOSTI ZA MEŠANJE S POLARNIMI ALI NEPOLARNIMI HERBICIDI**

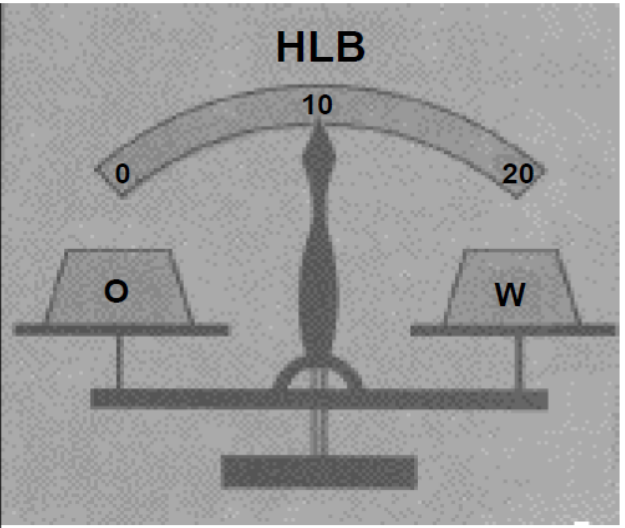




When oil-loving groups in surfactant are predominant, HLB is low... for producing water-in-oil emulsions.



When water-loving groups predominate, the surfactant has high HLB and is used for oil-in-water emulsions.



When oil-loving and water-loving groups are fairly well balanced, HLB is intermediate (around 10).

table 1: General guide for matching surfactant HLB to surfactant applications

Application	HLB Range
Mixing unlike oils	1 to 3
Water-in-oil emulsions	4 to 11
Antifoam	4 to 8
Wetting	7 to 12
Self-emulsifying oils	7 to 10
Oil-in-water emulsions	10 to 16
Detergent	12 to 15
Solubilize oils and microemulsions	13 to 18
Stabilizer	16 to 20

HLB Related to Solubility

The HLB of an emulsifier is related to its ***solubility***. Thus, an emulsifier having a low HLB will ***tend*** to be oil-soluble, and one having a high HLB will ***tend*** to be water-soluble, although two emulsifiers may have the same HLB and yet exhibit quite different solubility characteristics.

HLB Range	Use
4-6	W/O emulsifiers
7-9	Wetting agents
8-18	O/W emulsifiers
13-15	Detergents
10-18	Solubilizers

Adjuvants

This appendix is verbatim from The Nature Conservancy Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas (Tu, Mandy, et. al. 2001. Wild Invasives Species Team, The Nature Conservancy) (TNC 2001). It gives a comprehensive overview of adjuvants and their relationship to herbicides.

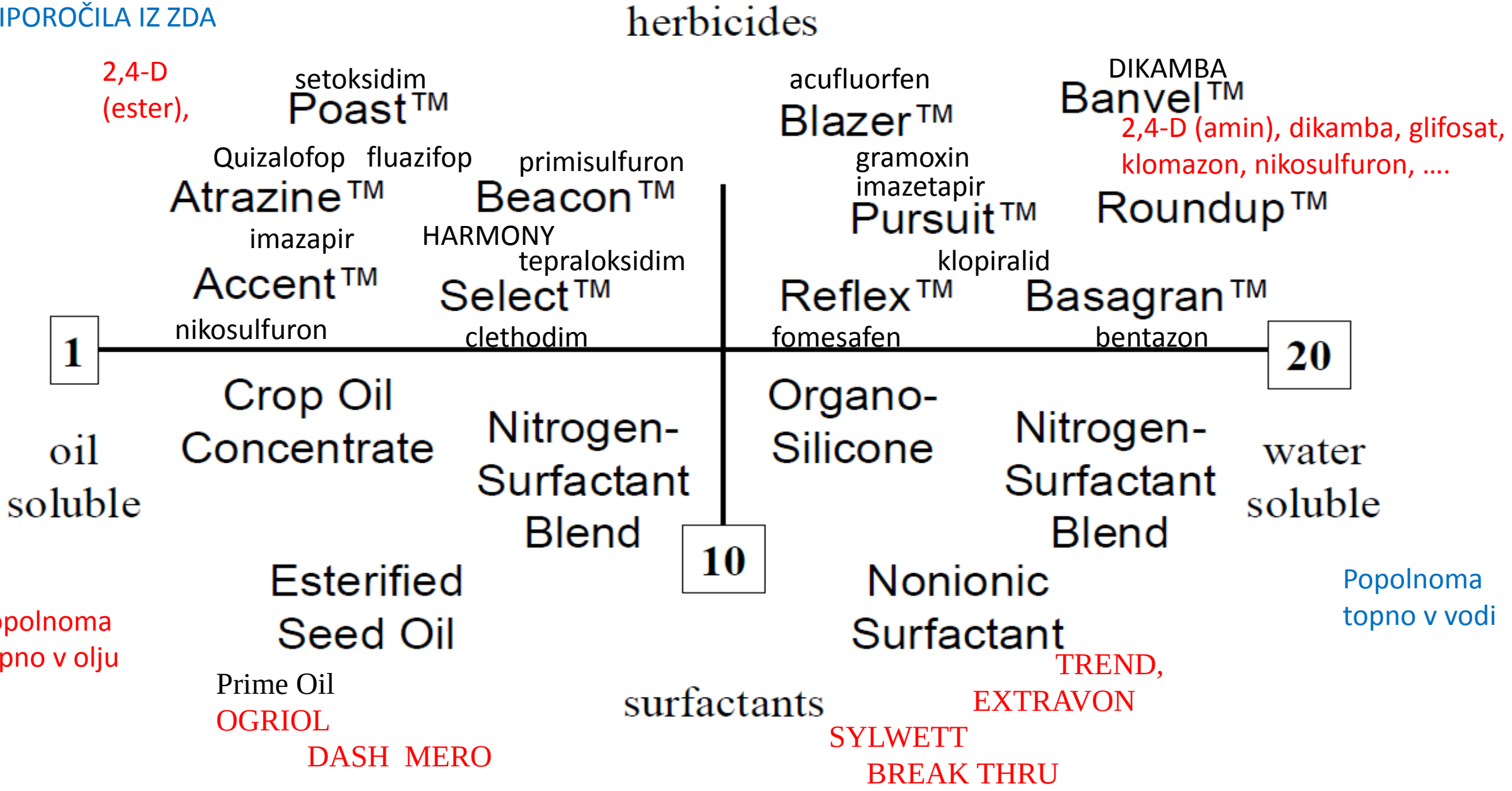
Box 6: Hydrophilic-Lipophilic Balance (HLB)

Surfactants contain both hydrophilic and lipophilic components (this is called amphiphatic). The hydrophilic-lipophilic balance (HLB) is a measure of the molecular balance of the hydrophilic and lipophilic portions of the compound. Many herbicides have an optimum surfactant HLB, and surfactants that most closely match a particular herbicide's optimum HLB will optimize the formulation's spread on and penetration into plants. Unfortunately, information about the HLB of most surfactant products is not available or hard to find, and so matching them appropriately is difficult (Green 2001).

For nonionic surfactants, the optimum surfactant HLB for a herbicide can be predicted based on the solubility of the herbicide in water (Griffen 1954 *in* Green 2001). For ionic surfactants, the HLB can be estimated by observing their dispersablity in water (with no dispersion = 1 to 3; poor dispersion = 3 to 6; unstable milky dispersion = 6 to 8; stable milky dispersion = 8 to 10; translucent to clear dispersion = 10 to 13; and clear solution = 13+).

Typically, low HLB surfactants work best with water insoluble herbicides, while high (>12) HLB surfactants work best for water-soluble herbicides. For example, surfactants with a high HLB are more active with the hydrophilic herbicide glyphosate, while more lipophilic, low HLB surfactants are more active with the lipophilic quizalofop-P ester. Surfactants with intermediate HLB values are the most active with intermediately soluble nicosulfuron. Additionally, low HLB surfactants permit the formation of invert emulsions (water-in-oil). Mid- and upper-range HLB may be wetting agents or for oil-in-water emulsions, and high HLB surfactants are often used as detergents or solubilizers. One the other hand, a surfactant that is incorrectly matched may even deactivate a herbicide (Gaskin & Holloway 1992).

PRIPOROČILA IZ ZDA



Popolnoma topno v olju

Popolnoma topno v vodi

Figure 2: Hydrophilic-lipophilic balance (HLB) range of herbicides and surfactants.

Primer komercialnega podajanja podatka o HLB

Table 1

Air Products Specialty Surfactants for Agrochemical Industry

Physical Property	Product Name	HLB	Wettable Powders (WP)	Emulsifiable Concentrates (EC)	Granules (GR)	Solution Concentrate—Soluble Liquids (SL)	Suspension Concentrates (SC)	Oil in Water Emulsions (EW)	Capsule Suspensions (CS)	Water-Dispersible/Water-Soluble Granules (WG/SG)	Suspo-Emulsions (SE)	Micro-Emulsions (ME)	Tank Mix Adjuvants	EPA 40 CFR 180 Listing
Dynamic Wetting/ Defoaming	Surfynol 104[a]	4	•				•	•		•			•	Yes
	Surfynol 420	4	•				•	•		•			•	No
	Surfynol 82[a]	5	•				•			•			•	Yes
	Surfynol 440	8	•				•			•			•	Yes
Grind Aids	Surfynol CT-211	9–10	•				•			•			•	Yes
Grind Aids	Carbowet DC01	11	•				•			•			•	Yes
Grind Aids	Surfynol CT-221	12	•				•			•			•	Yes
Grind Aids	EnviroGem 2010	13–14	•	•	•	•	•	•	•	•	•	•	•	Yes
Wetting/ Low Foaming	Surfynol 465	13–14	•	•	•	•	•	•	•	•	•	•	•	Yes
Wetting/ Low Foaming	Surfynol 485[a]	17	•	•	•	•	•	•	•	•	•	•	•	Yes
Superwetters	EnviroGem 360	3–4	•			•	•		•				•	No
Superwetters	Dynol 604	3–4	•			•	•		•				•	No
Superwetters	Dynol 607	8	•			•	•		•				•	No

Močil ne uporabljamo na pamet iz naslednjih razlogov:

Lahko povečajo fitotoksičnost herbicida za gojeno rastlino

Lahko povzročijo spremembe na povrhnjici rastline zaradi česar se lahko poveča vdor škodljivih gliv in bakterij

Lahko pride do nekompatibilnosti med močili v pripravku in dodanim močilom zaradi katere se pojavijo skupki v škropilnici in tudi skupki v depozitu na površini rastline

Lahko pride do reakcije med anionskim močilom in kationskim herbicidom in obratno

Pri veliki porabi vode lahko veliki odmerki močil celo zmanjšajo oprijem depozita (npr. silikonska omočila)

Lahko zmanjšajo vstopanje herbicida v rastlino (oljni surfaktanti lahko zmanjšanje vstopanja nekaterih visoko vodotopnih hidrofilnih herbicidov, npr. glifosat ali obratno izraziti humektanti zmanjšajo vstop izrazito lipofilen aktivne snovi)

Lahko se zgodi, da ni več zagotovljeno časovno obdobje karence (upočasnjen razpad a.s.)

Ponekod ne dovolijo uporabe dodatkov, če ti niso navedeni v registraciji herbicida (FORMALNI ZAPLETI)

Včasih nimamo podatka o optimalnem odmerku, glede na kombinacijo tipa herbicida in vrste poljščine

Weed Technology. 2000. Volume 14:807–813

Učinek dodatka je tesno povezan z naravo rastlinske povrhnjice. Učinki enakega dodatka so pri različnih plevelih različni IN VEDNO ZATIRAMO MEŠANICO ZELO RAZLIČNIH PLEVELOV. Pri uporabi se je potrebno odločiti, kateri skupini plevelov je dodatek primarno namenjen.

Symposium

Interaction of Surfactants with Plant Cuticles[1]

F. DAN HESS and CHESTER L. FOY[2]

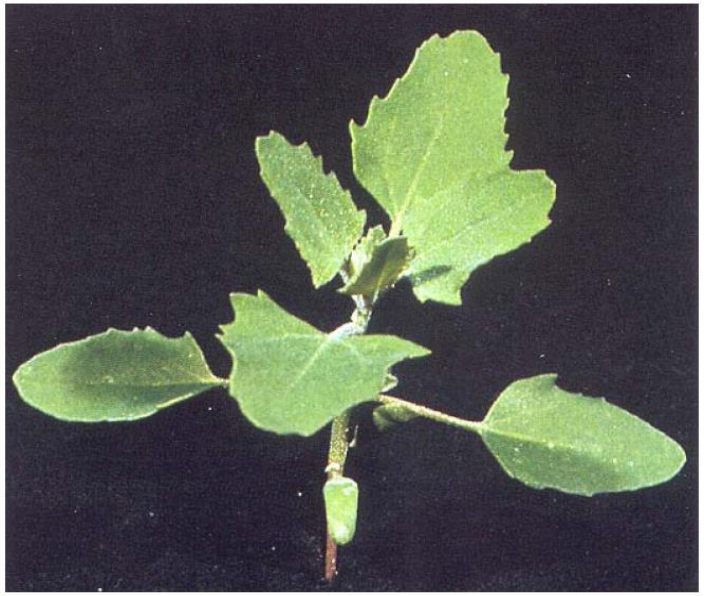
Abstract: How surfactants modify the characteristics of a spray liquid is now reasonably well understood. Beneficial effects are primarily associated with reduction in surface tension. However, the mechanisms whereby surfactants enhance the diffusion of herbicides across the plant cuticle are less clear. Generally, hydrophilic surfactants with a high hydrophile/lipophile balance (HLB) are most effective at enhancing penetration of herbicides with high water solubility, whereas lipophilic surfactants with a low HLB are most effective for enhancing uptake of herbicides with low water solubility. Both high- and low-HLB surfactants are absorbed into the cuticle, but current theory suggests different mechanisms are involved in enhancing diffusion of hydrophilic and lipophilic herbicides across the cuticle. Surfactants having a high HLB are absorbed into the cuticle and enhance the water-holding capacity (hydration state) of the cuticle. With increased cuticle hydration, the permeance of hydrophilic herbicides into the cuticle is increased, which increases the herbicide diffusion rate at a constant concentration gradient. Surfactants having a low HLB are absorbed into the cuticle and increase the fluidity of waxes, as measured by a small reduction in melting point. This increased fluidity increases the permeance of lipophilic herbicides in the cuticle, which, in turn, increases their diffusion rate at a set concentration gradient.

Additional index words: Herbicide diffusion, hydrophile/lipophile balance, surfactant mechanism of action, partition coefficient, permeance, postemergence herbicide absorption.

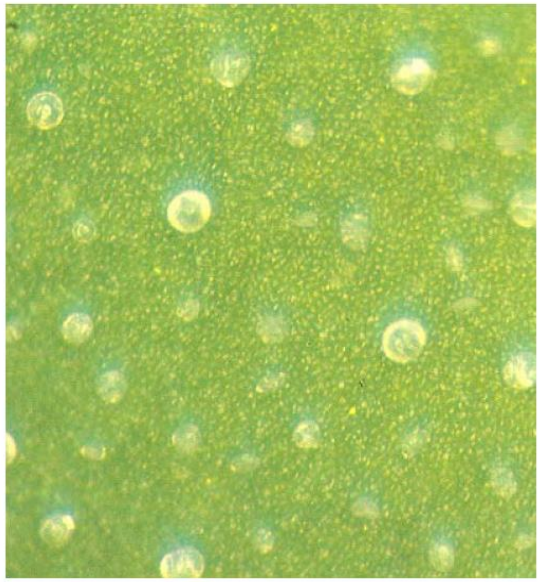
Abbreviations: EO, ethylene oxide; HLB, hydrophile/lipophile balance.

- Common Lambsquarters (*Chenopodium album* L.).

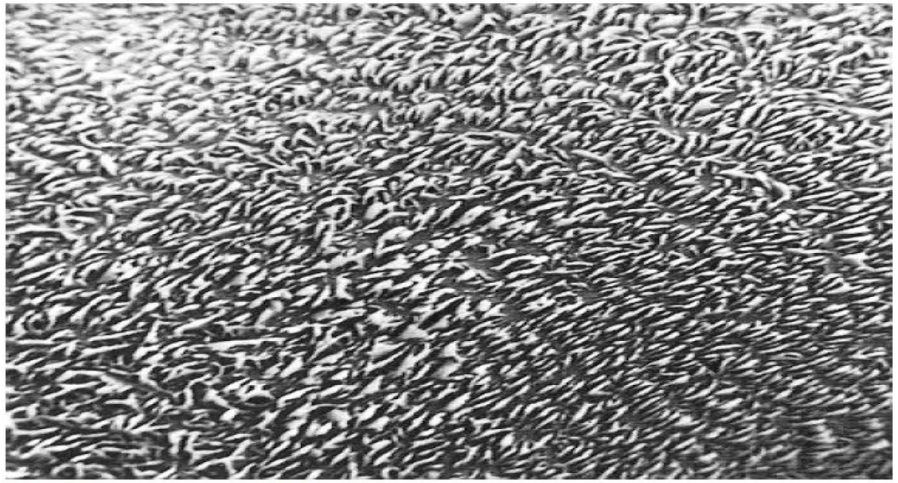
BELA METLIKA – PLEVEL Z VOŠČENO KRISTALASTIM POPRHOM NA POVRŠINI, KI ODBIJA VODO



Light microscope – 35X

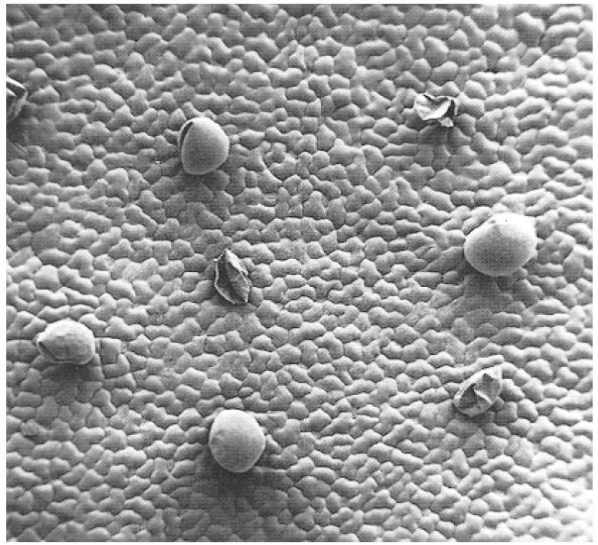


Scanning electron microscope – 3500X

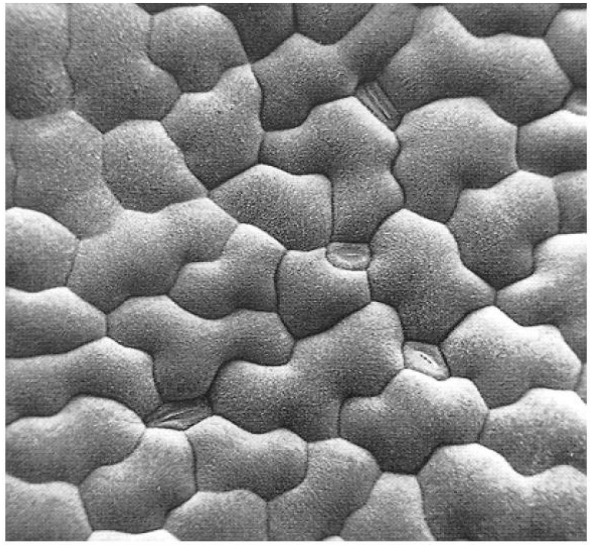


Note epicuticular wax

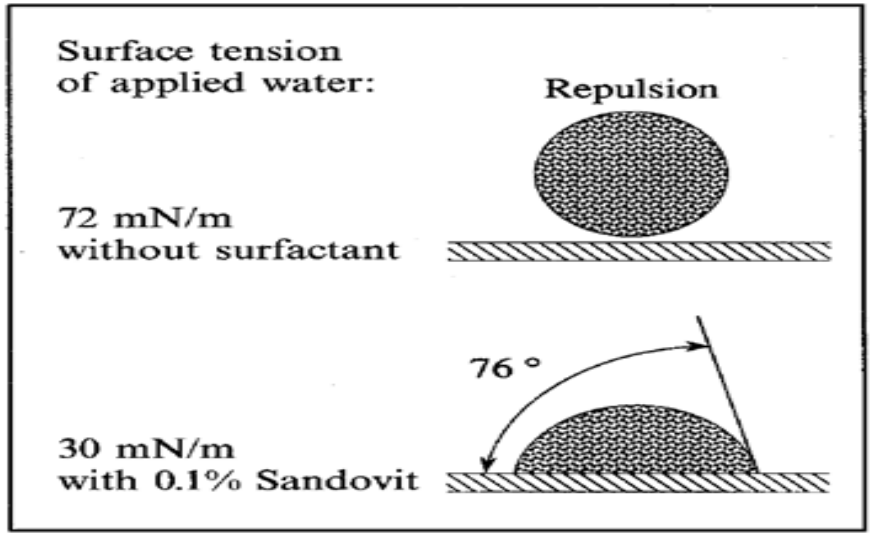
Scanning electron microscope – 70X



Scanning electron microscope – 350X



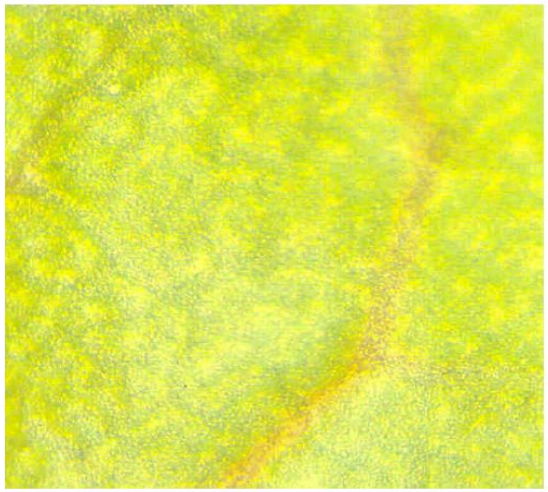
Contact angle on leaf surface



- Redroot pigweed (*Amaranthus retroflexus* L.).

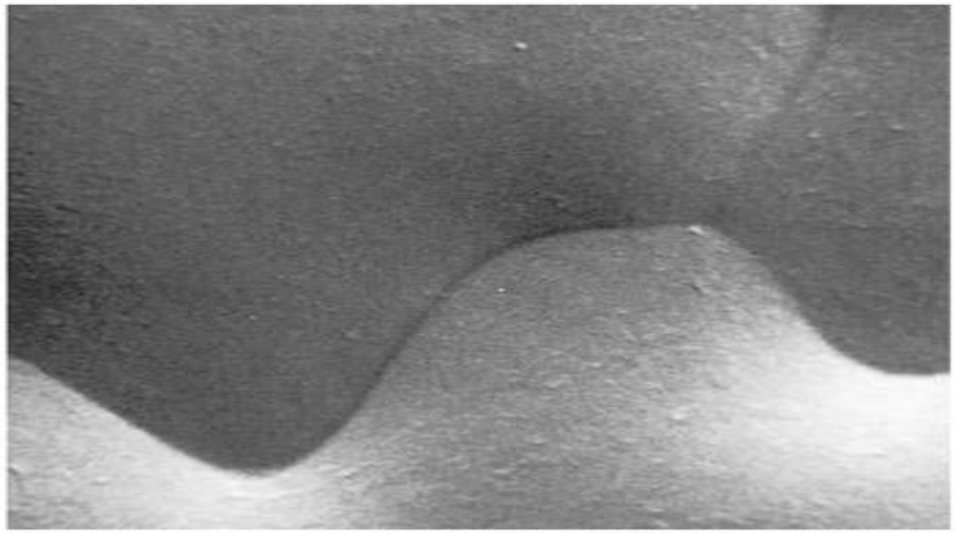


Upper leaf surface
Light microscope – 35X

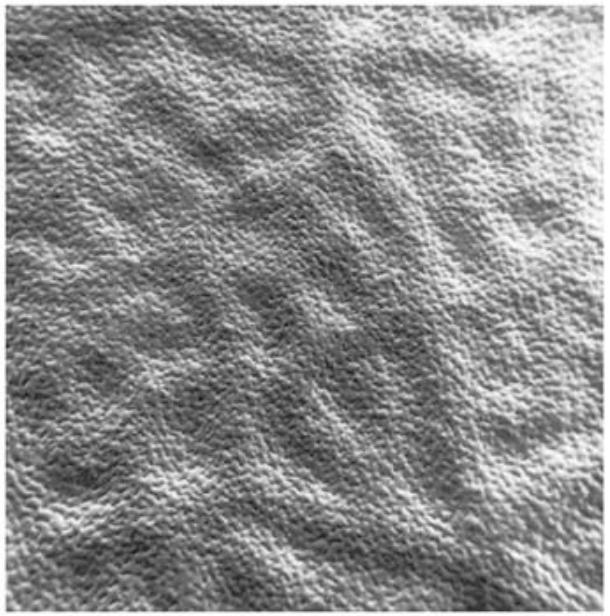


Ščiri so pleveli, ki imajo dobro omočljivo povrhnjico in ni velike potrebe po dodatkih

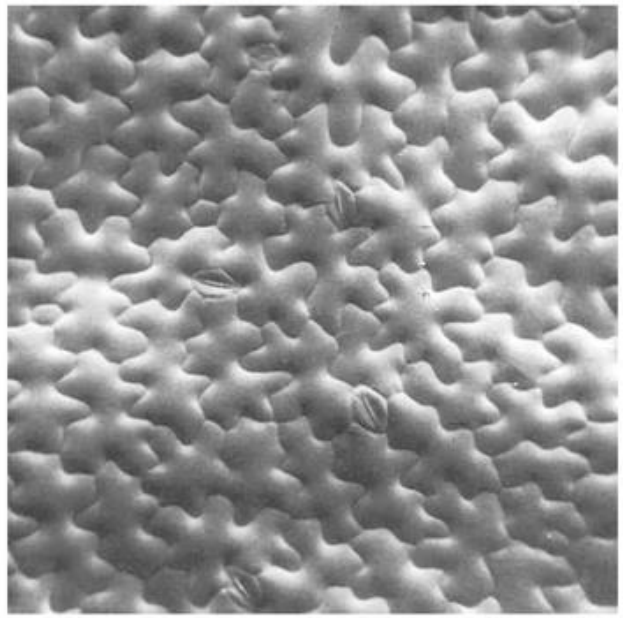
Scanning electron microscope – 3500X



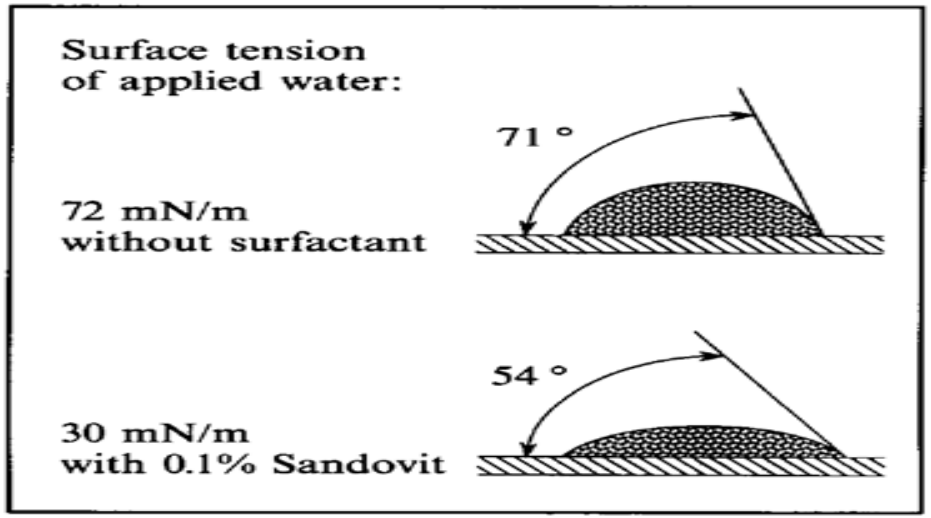
Scanning electron microscope – 70X



Scanning electron microscope – 350X



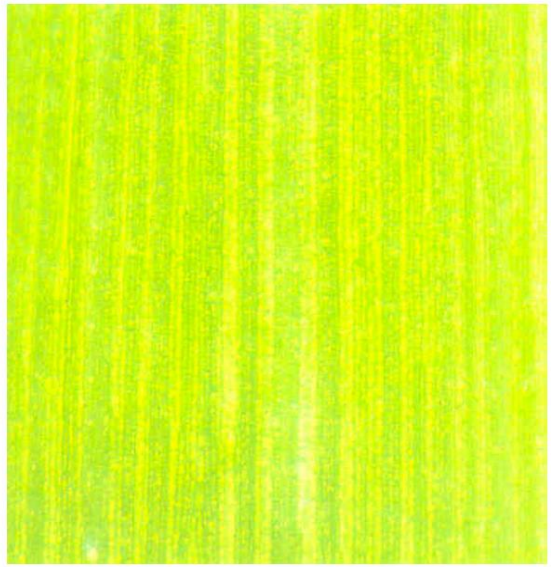
Contact angle on leaf surface



- Johnsongrass (*Sorghum halepense* L. Pers.).

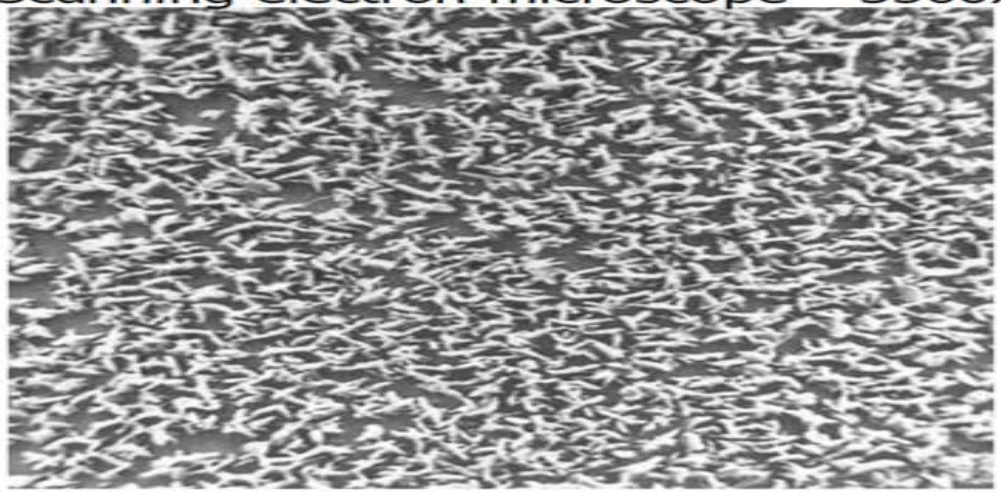


Upper leaf surface
Light microscope – 35X



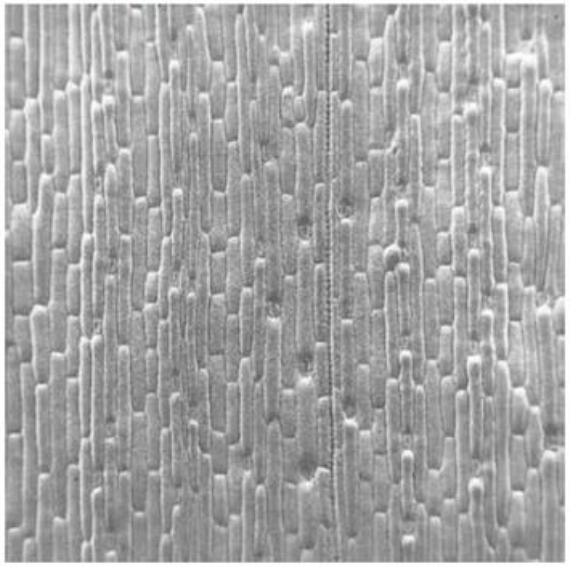
Listi trav so najtežje omočljivi, imajo pokončen položaj in še veliko voščenih struktur, ki odbijajo vodo. Primer d. sirek.

Scanning electron microscope – 3500X

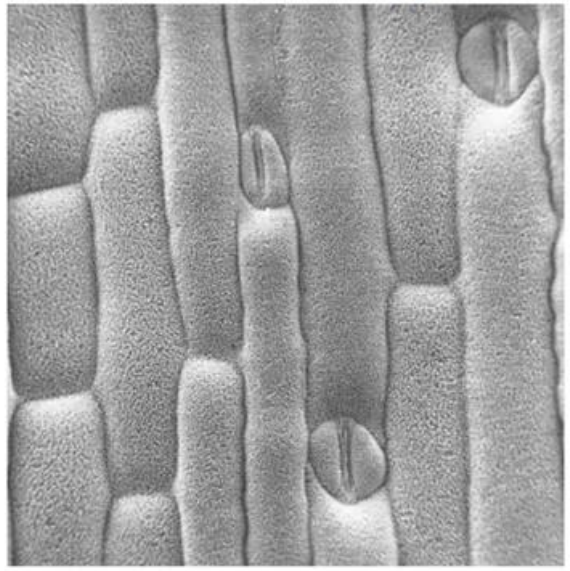


Note epicuticular wax that is characteristic of many grasses.

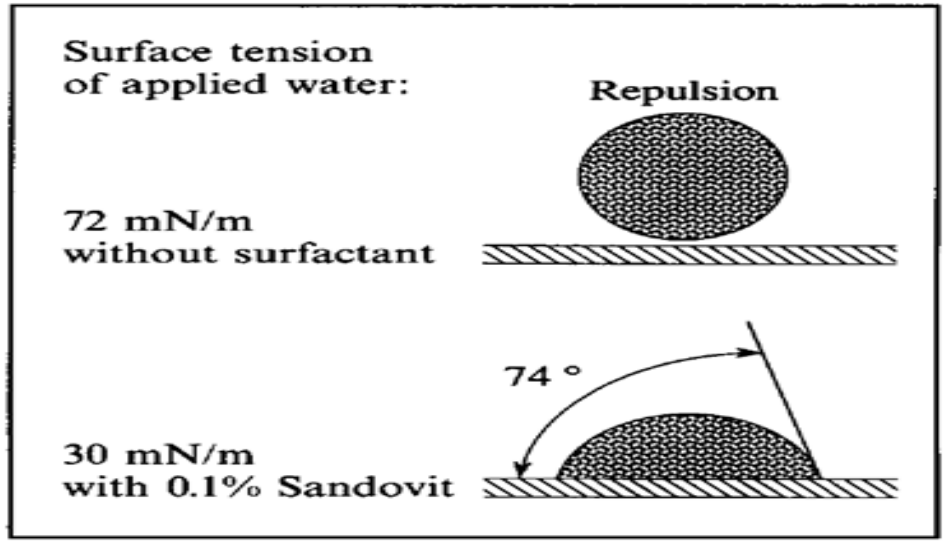
Scanning electron microscope – 70X



Scanning electron microscope – 350X



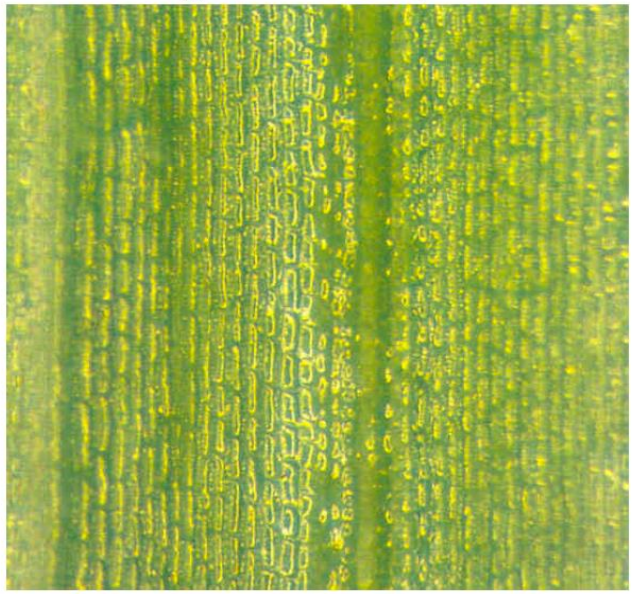
Contact angle on leaf surface



- Purple nutsedge (*Cyperus rotundus* L.).

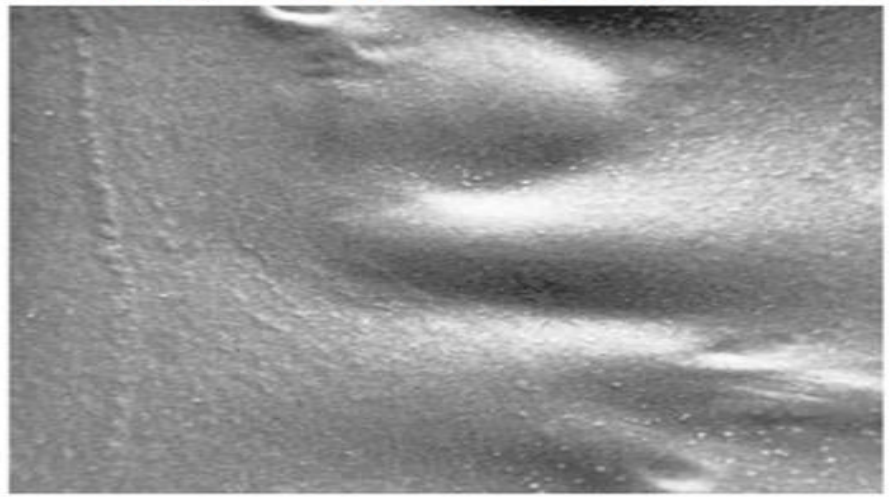


Upper leaf surface
Light microscope – 35X

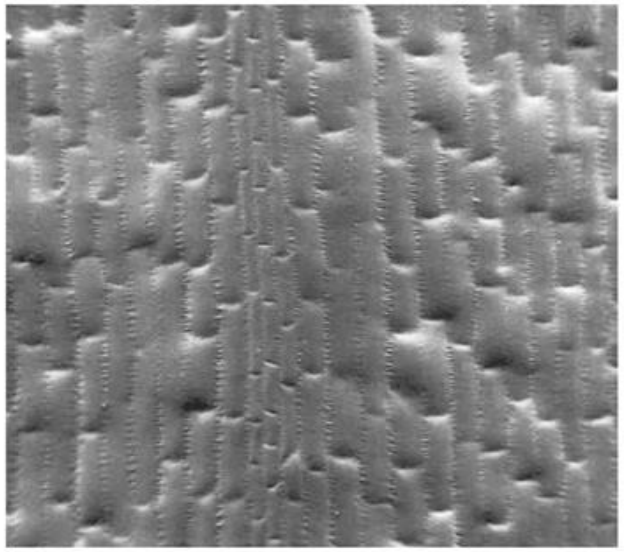


Nimajo vsi ozkolistni pleveli zelo nizke stopnje omočljivosti – primer lažje omočljivosti je ostrica

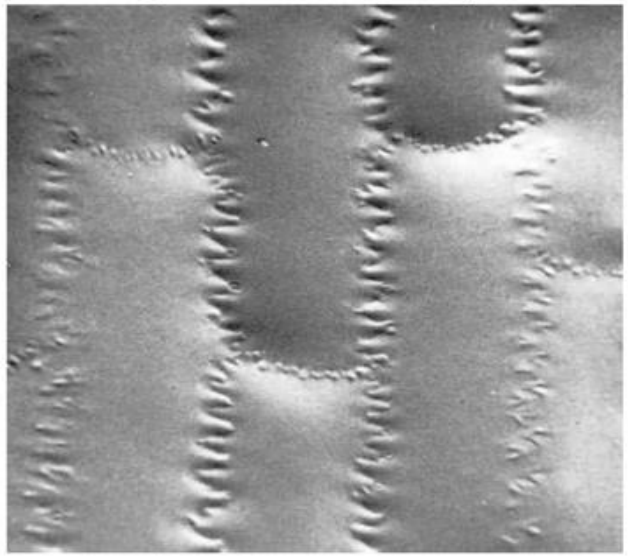
Scanning electron microscope – 3500X



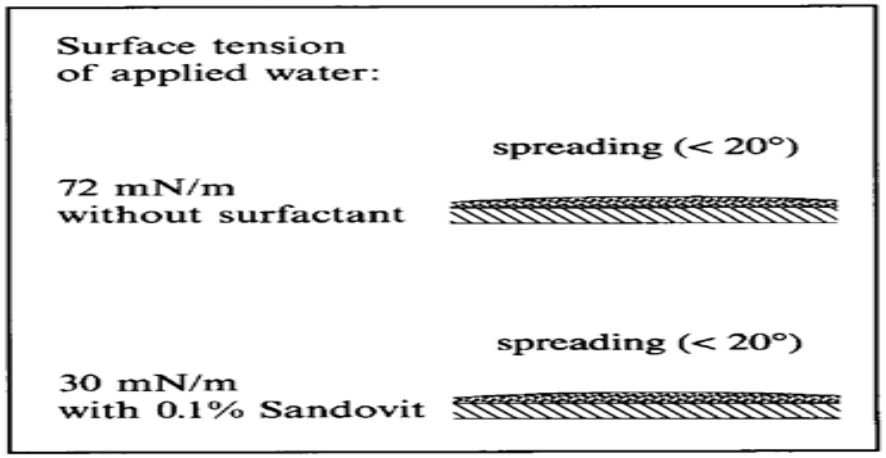
Scanning electron microscope – 70X



Scanning electron microscope – 350X

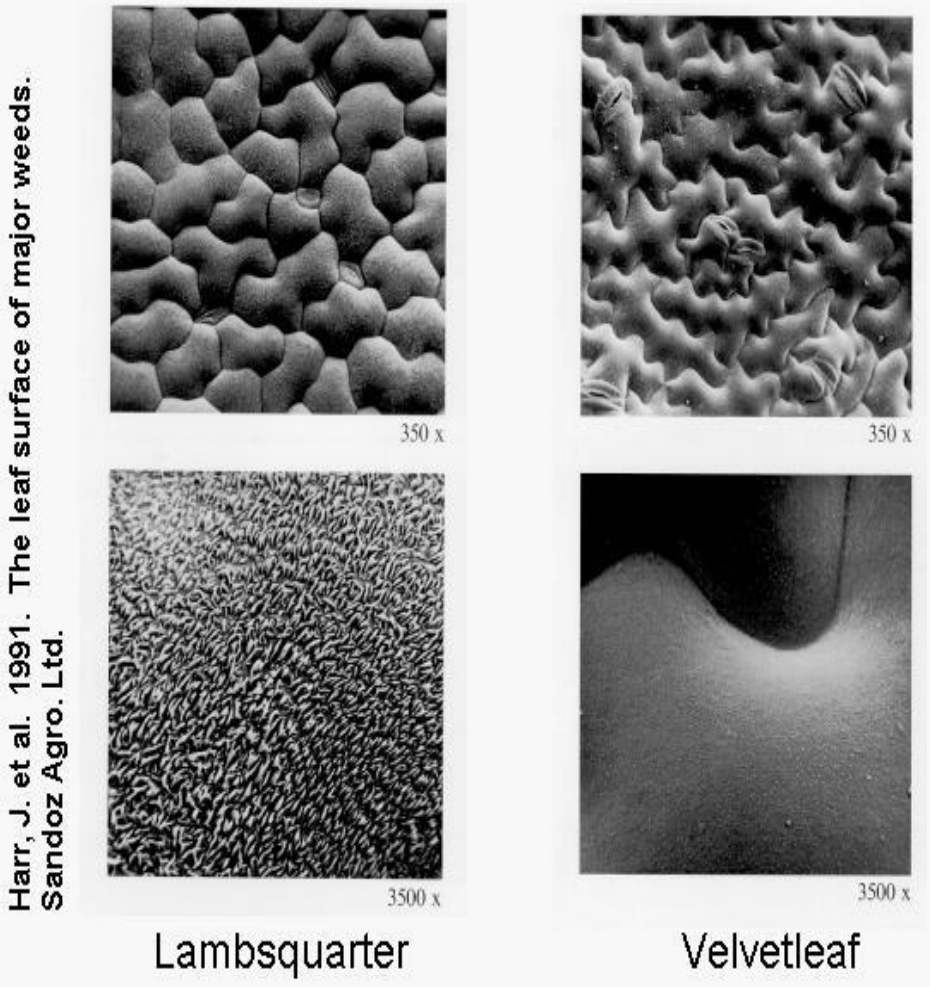


Contact angle on leaf surface



Vpliv površine plevela – fizikalno kemične lastnosti površine vplivajo na oblikovanje depozita herbicida tudi preko učinka pH površine. Primer razlike med baržunastim oslezom in belo metliko. Pri baržunastem oslezu ima isto neionsko močilo Sandovit bistveno boljši učinek, kot pri beli metliki, kjer močilo ne povzroči bistvenega zmanjšanja površinske napetosti.

re 3. Leaf surface characteristics of two weeds.

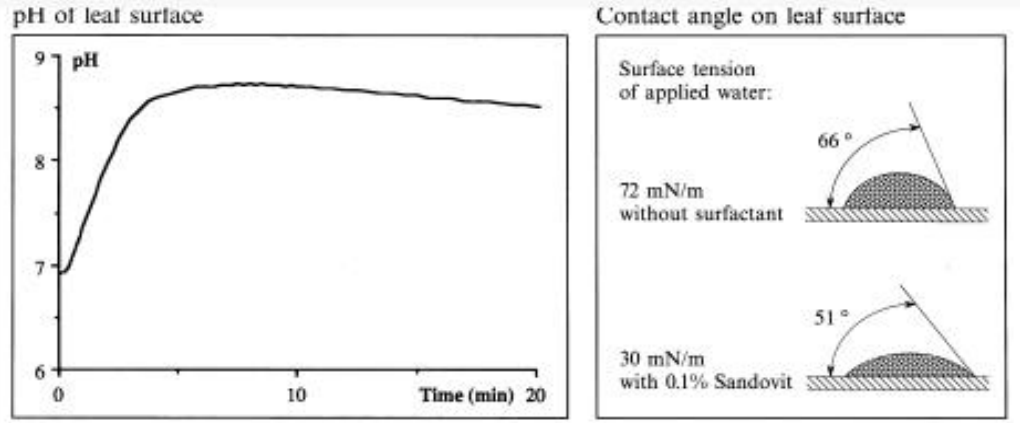


Harr, J. et al. 1991. The leaf surface of major weeds. Sandoz Agro. Ltd.

Figure 4. Influence of cuticle characteristics on leaf wettability.

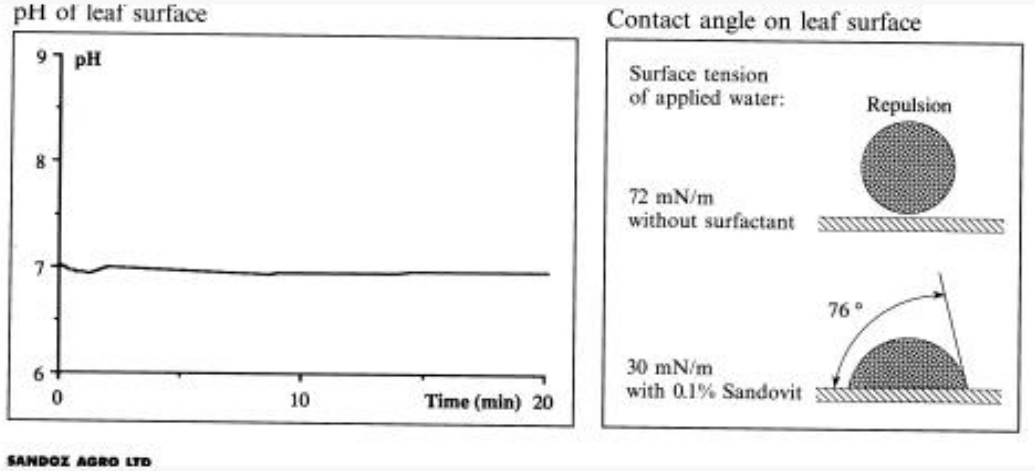
Velvetleaf

Oslez



Metlika

Lambsquarter



Harr, J. et al. 1991. The leaf surface of major weeds. Sandoz Agro. Ltd.

SPLOŠNI NAPOTKI

Glede na veliko heterogenost plevelnih populacij, je najmanj tveganj pri uporabi neionskih dodatkov pri zmerni porabi vode okrog 250 l/h in kapljicah velikih okrog 200 µm. Tukaj v številnih primerih lahko pričakujemo tolikšno povečanje učinkovitosti herbicida, da se nakup dodatka ekonomsko izplača. Značilen primer so sulfonilsečninski herbicidi.

Potrebno se je natančno držati navodil proizvajalca in tudi natančno odmerjati dodatek. Včasih so omejitve glede temperature.

Le proizvajalec z velikim številom poskusov lahko oceni uporabnost različnih pripravkov in dodatkov.

Zelo redko je možno združevati več dodatkov hkrati – na splošno to ni priporočljivo.

V stresnih vremenskih razmerah se dodatki ne obnašajo, kot je predvideno, ne na delovanje herbicida in ne glede stopnje fitotoksičnosti za gojeno rastlino.

Herbicidom za trave iz skupine FOP in DIM pri majhni porabi vode ustrezajo oljni dodatki, pri nekaj večji porabe vode pa anionski in neionski dodatki.

Če proizvajalce v navodilu za uporabo ne definira jasno potrebe po uporabi nekega dodatka ali pa ne poda priporočilo za konkreten tip močil, dodajanje dodatkov ni smiselno in večinam ni ekonomsko učinkovito.

Tudi dodatki so lahko ekološko oporečni.

Ali je uporaba kemikalij z učinkom povečevanja kapljic enako uporaben pristop, kot uporaba antidriftnih šob, ki prav tako oblikujejo velike kapljice?

Ne popolnoma, ker je kinetika trka drugačna. Učinek drift retardanta je ugoden za potovanje kapljice po zraku, je pa manj ugoden pri trku kapljice s ciljno površino.

Ali je kinetika kapljic pri trku ob ciljno površino enaka, pri velikih kapljicah iz antidriftne šobe ali velikih kapljicah iz standardne šobe?

Ne popolnoma, ker je kinetika trka drugačna. Kapljica iz antidriftne šobe se ob trku dezintegrira drugače, kot velika kapljica iz navadne šobe. Pri antidriftni šobi so manjše izgube.

PRIČAKOVANJA OD DRIFT RETARDANTA - obseg zmanjšanja drifta v pasu do 10 m od roba njive pri uporabi DRT ali antidriftne šobe, bočni veter med 2 in 3 m/s.
(ocene M. Lešnik iz nekaterih zelo redkih člankov)

Parametri škropljenja:	Običajni DRT (izenačevanje)	Zelo dobri DRT (izenačevanje + povečevanje)	Antidfitna šoba, ki poveča velikost kapljic za 40%
200 l/ha, VMD nad 200 µm	- 15 %	- 25 %	- 30 – 50 %
300 l/ha, VMD nad 250 µm	- 10 %	- 20 %	- 30 – 40 %
200 l/ha, VMD tik nad 100 µm	- 20 %	- 30 %	- 30 - 50 %
100 l/ha, VMD tik nad 100 µm	- 25 %	- 40 %	- 40 - 50 %

Retardanti so lahko zelo uporabni za aplikacije herbicidov pred vznikom plevelov, kjer omočenje rastlin ni predmet performančnih zahtev. Izenačenost velikosti kapljic ni vedno prioriteta, ker je plevelna populacija sestavljena iz zelo različnih plevelov za katere so optimalne različno velike kapljice.

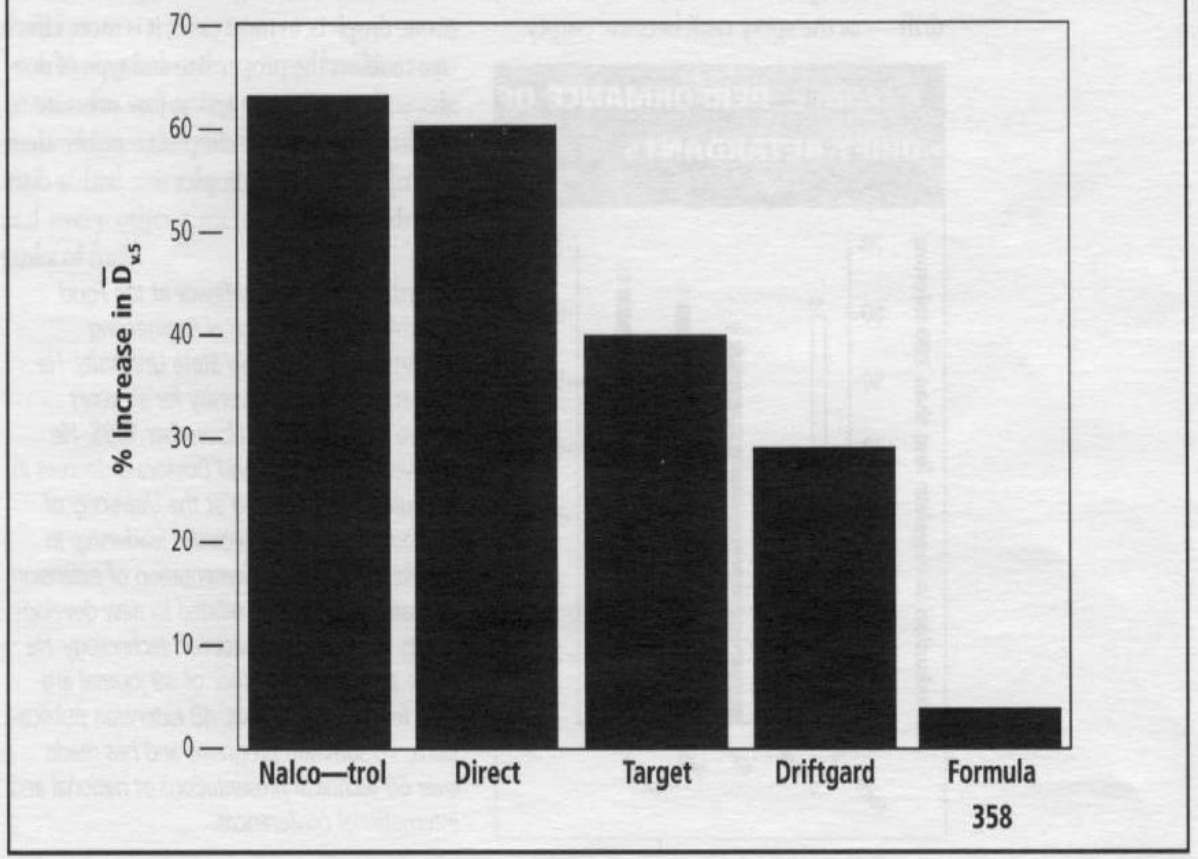
Do "drift retardant" chemicals work?

If used properly (at appropriate rates), these products indeed reduce spray drift by hindering formation of small, drift-prone droplets

By Erdal Ozkan

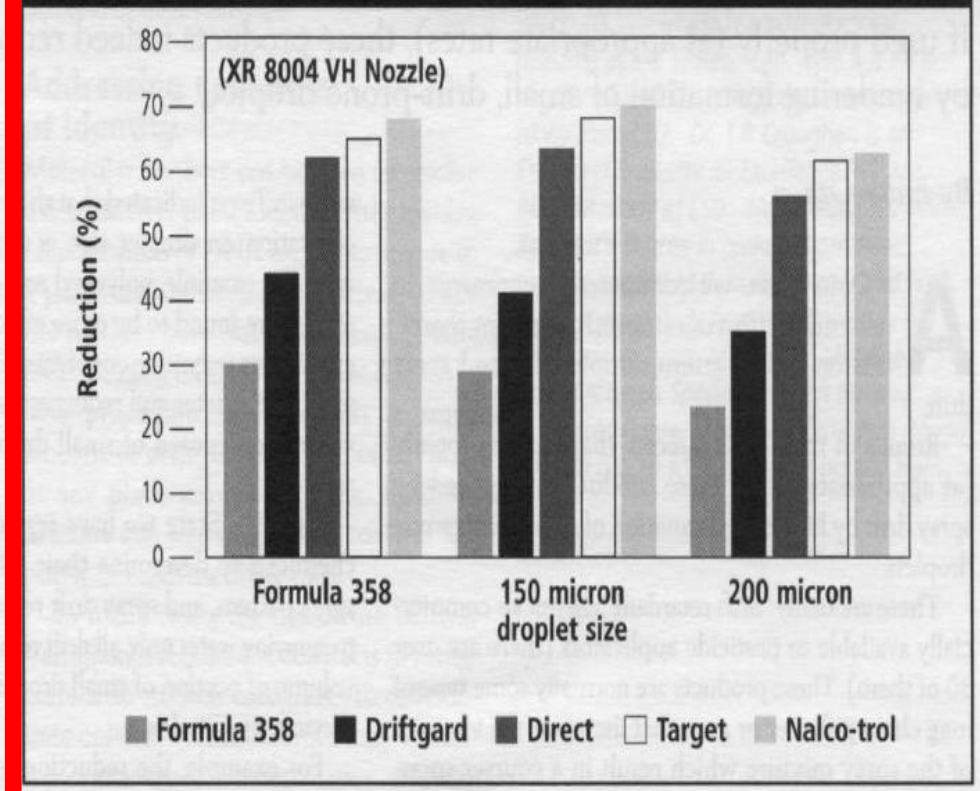
neers in Texas indicated that the effect of polymer concentration on droplet size is dependent on polymer

FIGURE 1. INCREASE IN WEIGHTED VOLUME MEDIAN DIAMETER ($D_{v.5}$) WITH DIFFERENT DRIFT RETARDANTS



It is usually more effective to select the proper nozzles and operate sprayers at low pressure to produce desired drop size than to increase droplet size with a drift retardant chemical.

FIGURE 1. REDUCTION IN SPRAY VOLUME IN DROPLETS LESS THAN 100, 150 AND 200 MICRONS



Some studies have found that some of these polymers tend to be sheared by passing through a sprayer pump, as would occur in normal bypass, hydraulic mixing in common agricultural sprayers. This means that the drift retardant would lose its ability to increase droplet size — its ability to reduce drift — as the spray tank became empty.

Gums are not sheared as easily as the long chain polymers, and some types of polymers (polyethylene oxide) are sheared in fewer passes through a pump than other types of polymers (polyacrylamides).

Although drift retardant chemicals are effective in reducing the number of drift prone droplets, in most cases, it is more effec-

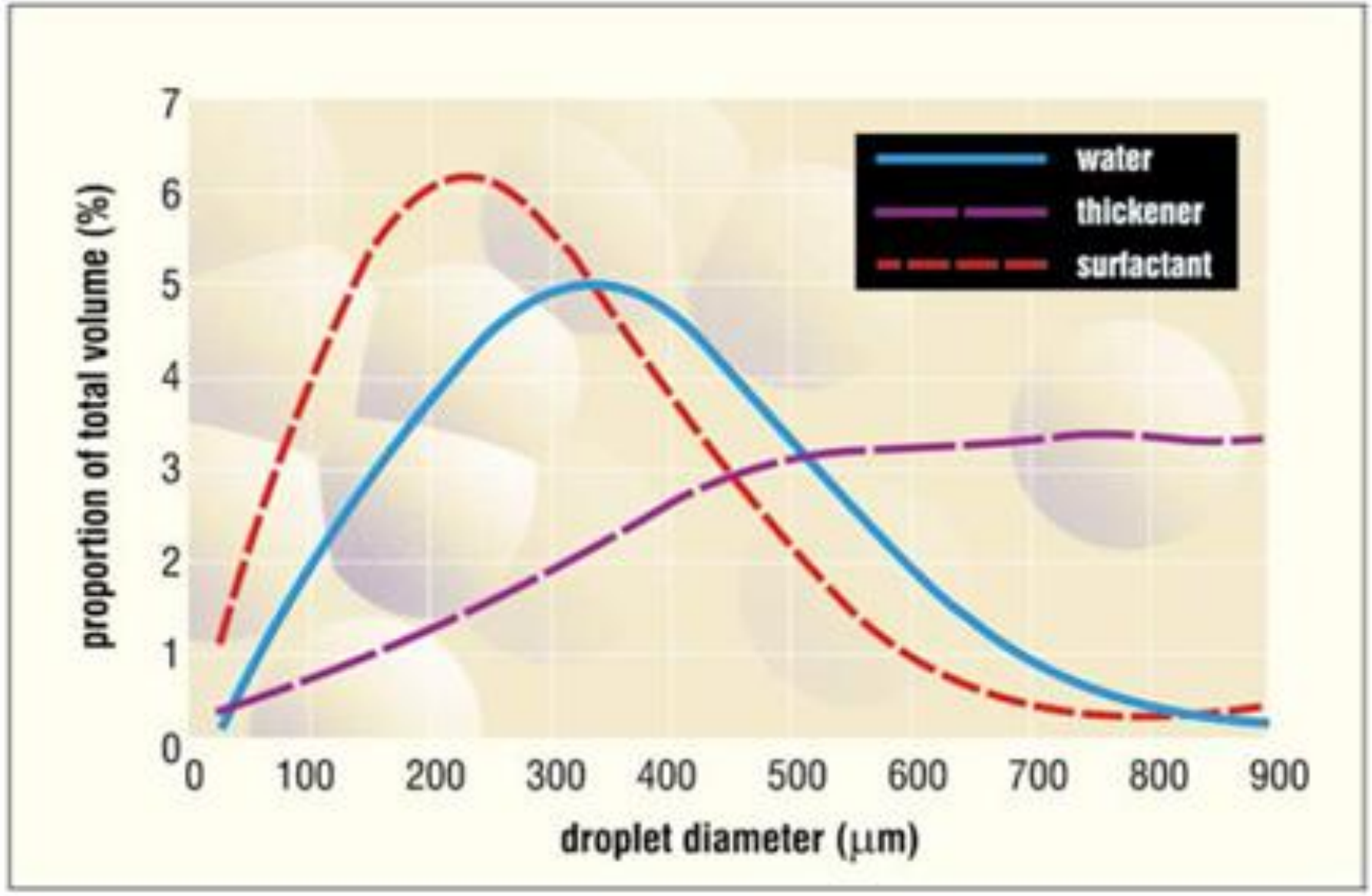


Figure 68. Droplet size spectra of water, surfactant and spray thickening, drift-reducing adjuvant sprayed through an XR8003 tip at 40 psi.

ROLE OF ADJUVANTS AND NOZZLES IN MANAGING DRIFT:
LESSONS FROM WIND TUNNEL, GREENHOUSE, AND FIELD STUDIES

Greg Kruger, Brad Fritz, Andrew Hewitt, Ryan Henry, and Cody Creech [1/]

Primer nasprotnega učinka močila za zmanjšanje drifta pri istem tipu šobe

Polimerno omočilo je pri šobi Turbo TeeJet povzročilo zmanjšanje deleža majhnih kapljic,

Pri šobi Torbo Flood pa je povečalo delež majhnih kapljic.

Obstaja meja VMD nekega tipa šobe, kjer lahko pričakujemo retardantno delovanje dodatka. Pri flood šobah z zelo velikimi VMD dodajanje retardanta ni smiselno.

Enako bi veljalo, če bi imeli navadno šobo z velikim pretokom in bi delovala pri nizkem tlaku.

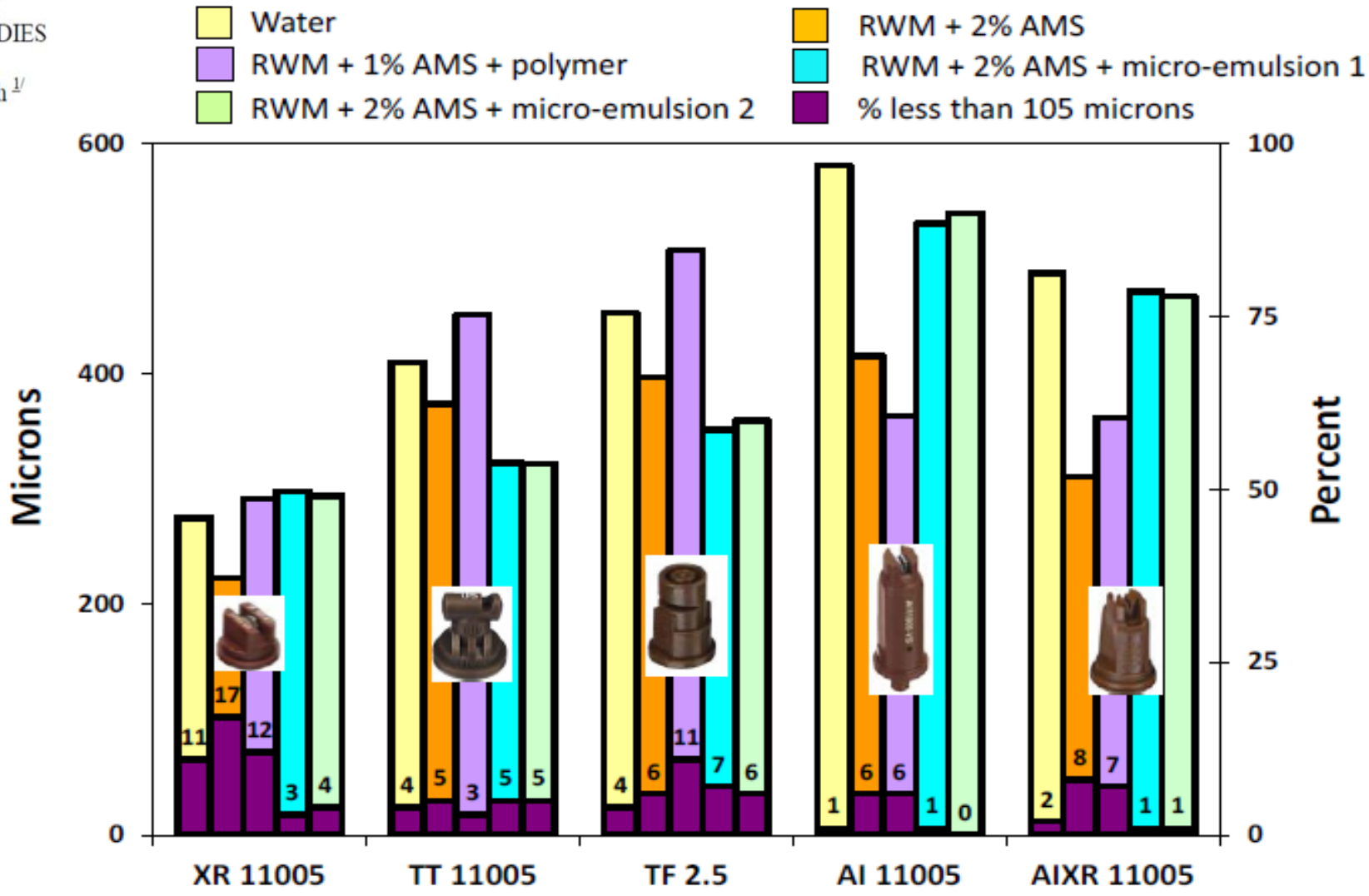
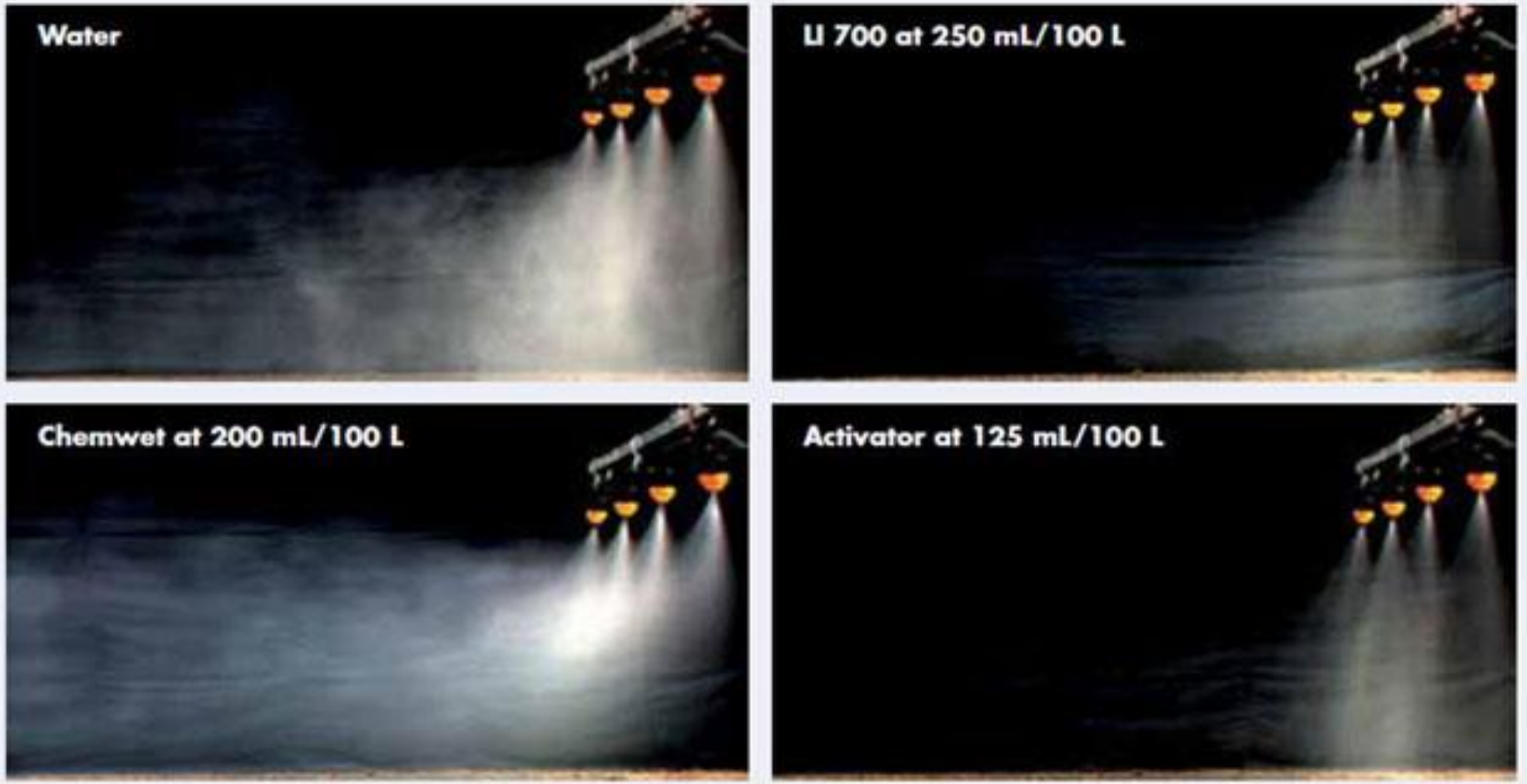


Figure 2. Influence of nozzle selection and adjuvant on the droplet size and % of the spray solution less than 105 microns. Interactions between spray solution and nozzle type can have a significant influence on droplet size distributions. Use of polymer adjuvants with Turbo TeeJet nozzles helped to manage the fines while the use of the same adjuvant with a Turbo Flood nozzle greatly increased the fines.

Primer nasprotujočega se učinka dveh dodatkov na porazdeljevanje kapljic pri enaki formulaciji herbicida. Neionsko močilo (Chemwet) je zmanjšalo kapljice in povečalo drift, močilo Activator je povečalo velikost kapljic in zmanjšalo drift pri enaki formulaciji herbicida.



Običajno dodatki, ki so deklarirani kot aktivatorji ali penetranti imajo drift retardantni učinek vendar ni nujno, da ga proizvajalec izpostavi.
Pri takšnih je potrebno paziti, da je višina armature na predpisani ravni od tal.

The effect of a spray adjuvant on the amount of drift generated from a nozzle. Note how some non-ionic wetters increase the amount of drift (eg Chemwet) while others can reduce drift (eg Activator).

Drift Retardants

- A drift retardant, or drift control agent, is a material used in liquid spray mixtures to reduce spray drift.
- Polymers increase droplet size, which decreases the distance the larger droplet travels.
- Invert emulsion suspensions create smaller, uniform droplets to increase deposition and decrease drift.

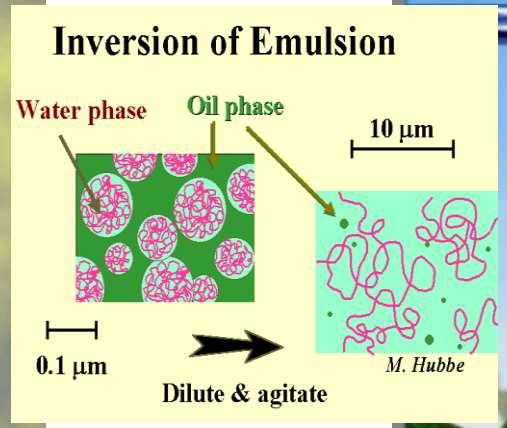
Obstajajo različno kakovostne kemije za povečevanje kapljic škropilne brozge. Pri polimerih so težave pri nižji temp in višjih delovnih tlakih. Invertne emulzije so boljše in dražje formulacije. Ne gre dobro za suspenzijske škropilne brozge.

Conventional - thickeners/polymers

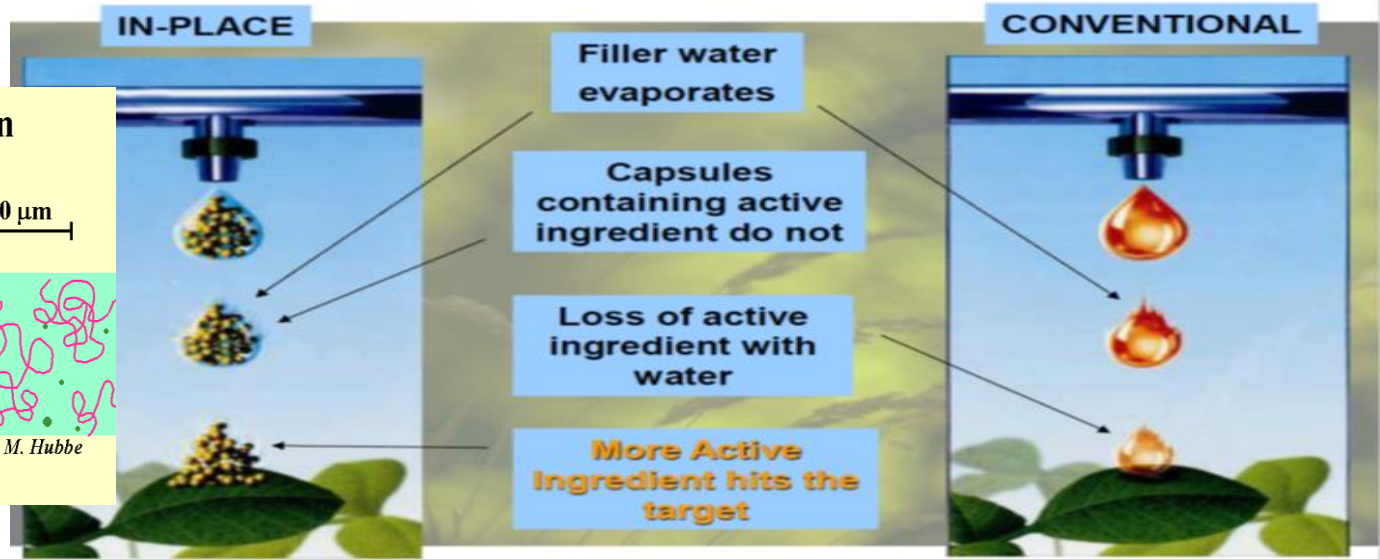
- Polymers work by thickening the spray solution, forming very large droplets that can reduce spray coverage.
- Thickeners only treat the water.
- Thickening the spray solution constricts the spray pattern, causing streaks.
- The effectiveness of thickeners is reduced by pump shear.

In-Place invert emulsion

- In-Place produces uniform positively-charged capsules that stick to the negatively-charged plants and soil.
- In-Place treats the chemical – not the water – and does not affect droplet size.
- In-Place minimizes drift and helps keep equipment cleaner.
- The effectiveness is <u>not decreased</u> by pump shear.

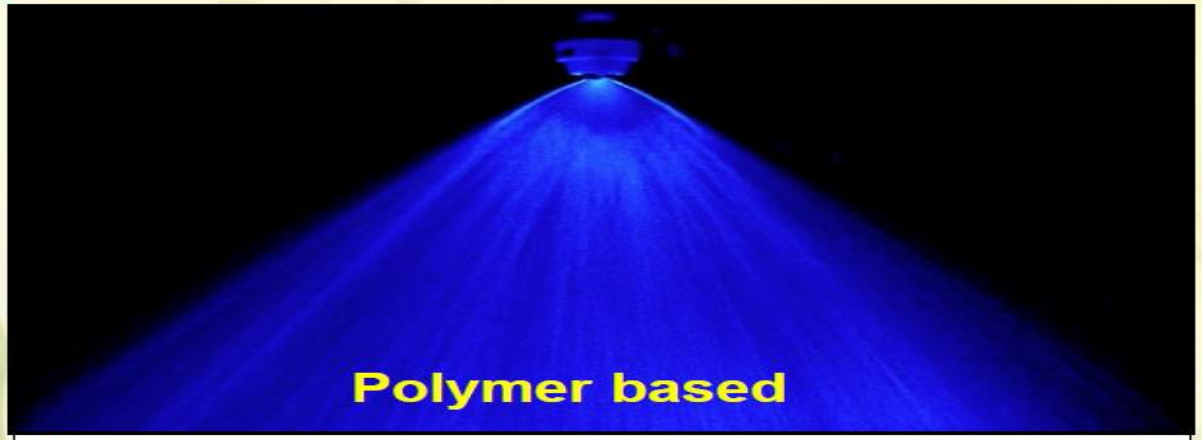


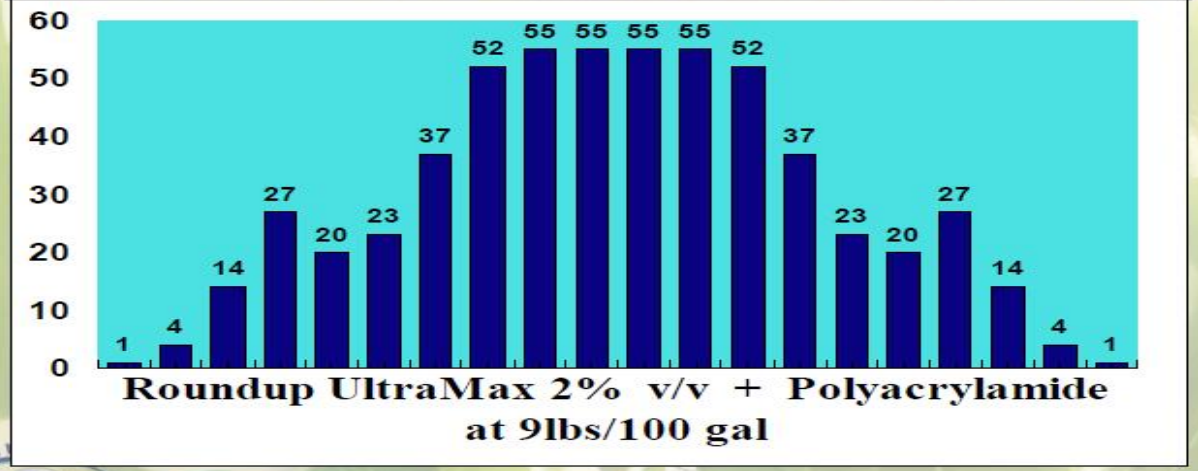
Application comparison with In-Place



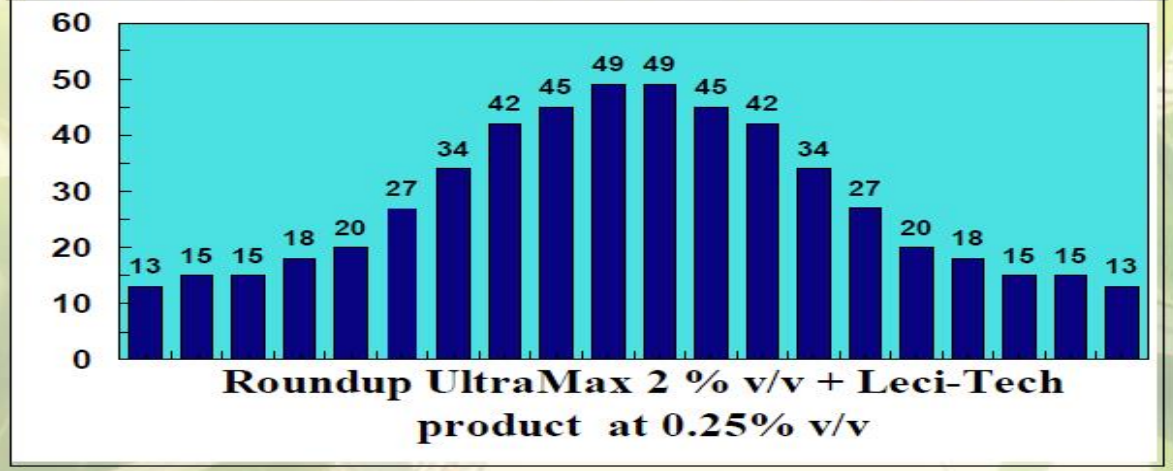
Nekateri antidriftni dodatki zmanjšajo uniformnost pretoka šob na različnih delih škropilne armature. Primerjave med polimernim, ki poslabša uniformnost in takšnim, ki bazira na sojinem olju in ne zmanjša uniformnosti. Primerjava paternatorskega diagrama (lov tekočine v mikro-žlebove na paternatorski testni mizi).

Adjuvant Effects on Fan Angle Patternator Results









Wills, Hank & Jones, Mississippi State Univ., 2001

Prikaz učinka polimernega drift retardanta na neenakomernost porazdelitve kapljic po širini škropilne armature
Po navodilih v tujini je uporabi drift retardantov potrebna prilagoditev višine škropilne armature

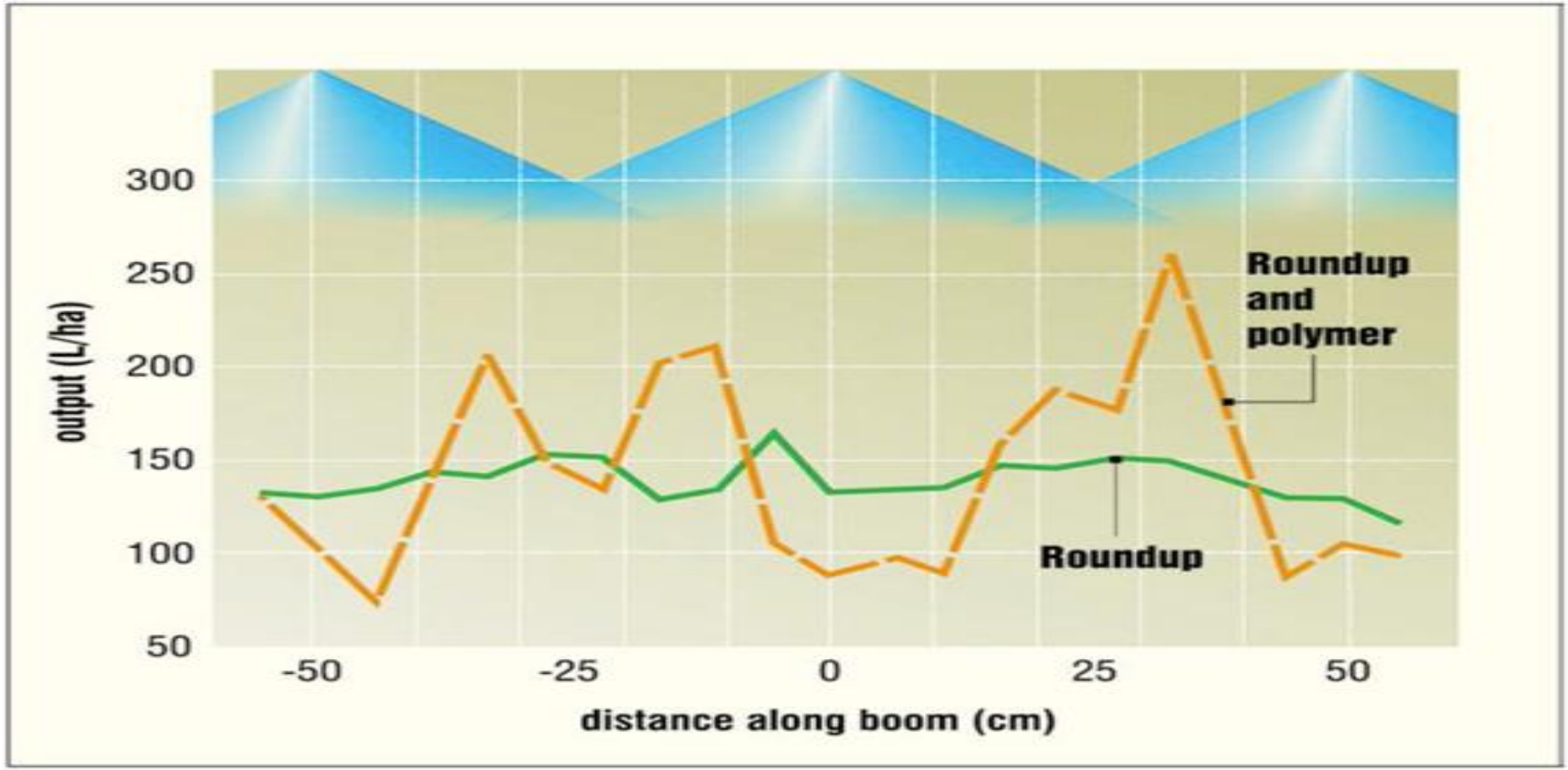


Figure 78. Effect of a drift-reducing adjuvant on the spray pattern of Roundup. Nozzle was an XR8003 at 40 psi pressure, traveling at 8 km/h. **Source 10**

Ali lahko neugodno kinetiko trka velikih kapljic, ki jih oblikujejo antidriftne šobe ublažimo z dodajanjem dodatkov, kot so wetter in spreader ??????

Da pri mnogih sistemičnih herbicidih za širokolistne plevele (dodajanje neionskega ali amfoternega omočila) izboljša učinkovitost herbicida in ublaži neugodno kinetiko trka.

Delno pri sistemičnih herbicidih za ozkolistne plevele (dodajanje neionskega ali amfoternega omočila).

Ali dodajanje silikonskih dodatkov dejansko ublaži slabši oprijem pri uporabi zelo velikih kapljic ?????

Večinoma da, če nimamo zelo velike porabe vode in ne delamo pri visoki zračni vlagi.

Ali dodajanje oljnih dodatkov dejansko popolnoma ublaži slabši oprijem pri uporabi velikih kapljic pri škropljenju trav ?????

Večinoma ne popolnoma, moramo imeti kombiniran dodatek olje + neionski dodatek (HSOC) in še vedno dokaj majhno porabo vode + šoba z dvojnim curkom.

Dodajanje superspreaderjev z hkratnim antidriftnim delovanjem raztopinam sistemičnim herbicidov, ki jih nanašamo z antidriftnimi šobami lahko dodatno poveča negativen učinek antidriftne šobe na učinkovitost herbicida pri nekaterih tipih plevelov (na primer ambrozija).
Primer dodajanja poliakrilamidnega drift retardanta glifosatnemu pripravku.

Herbicide Drift Reduction Methods - Study 2.

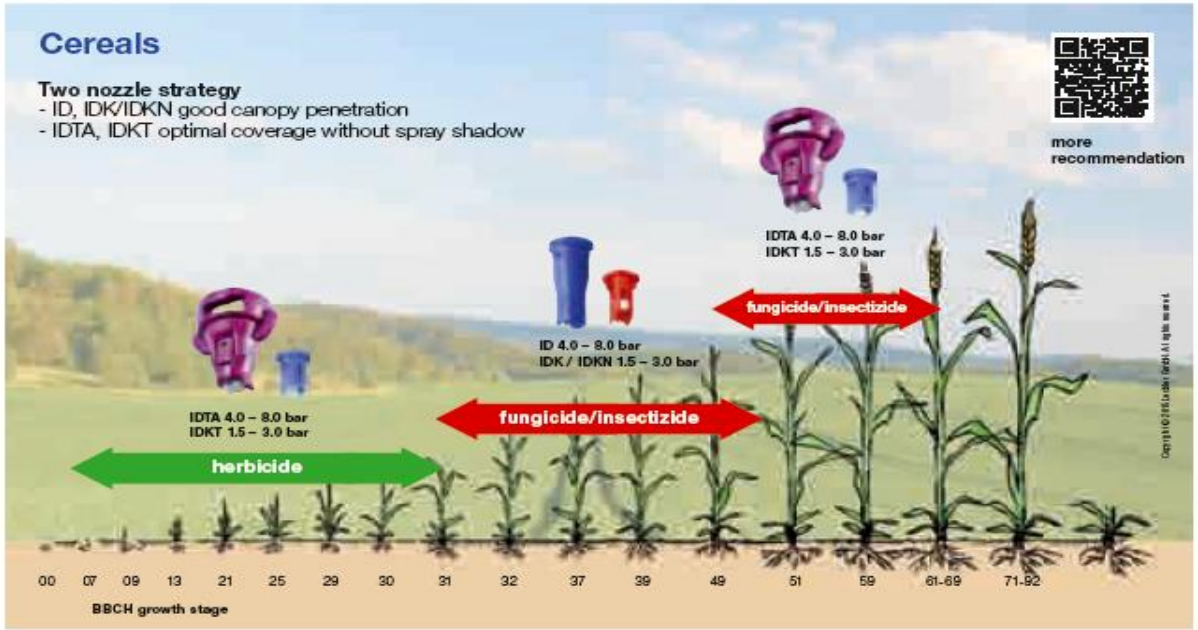
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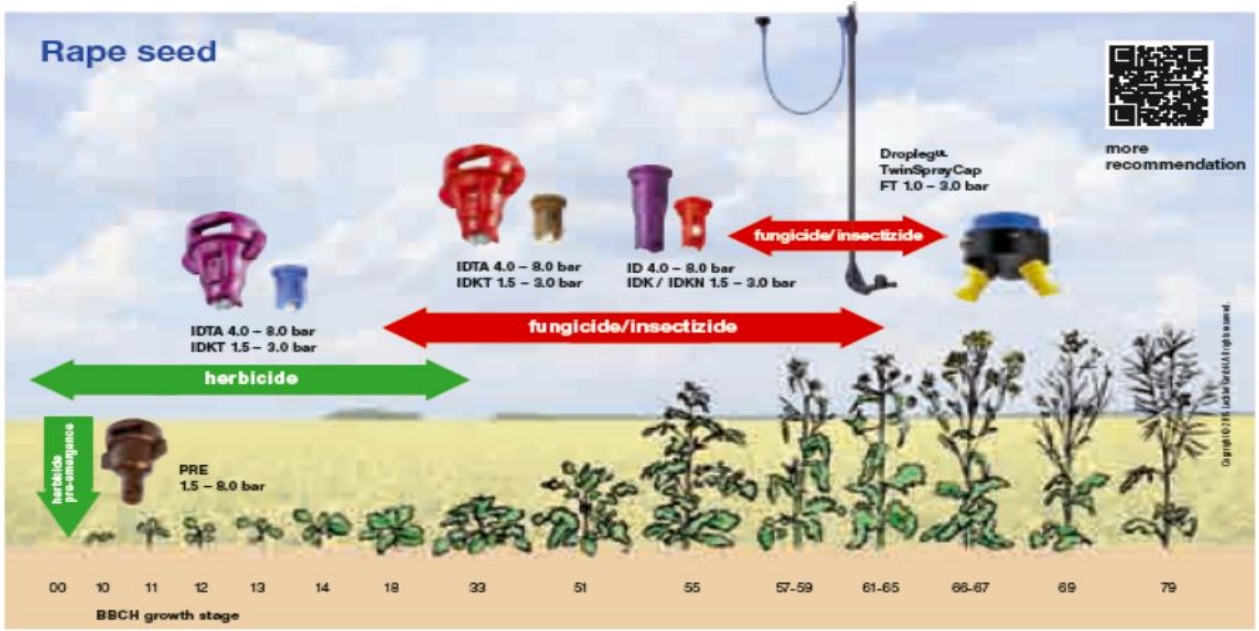
OBJECTIVE: Evaluate the efficacy associated with glyphosate applications performed using drift reduction type nozzles and drift control spray additives.

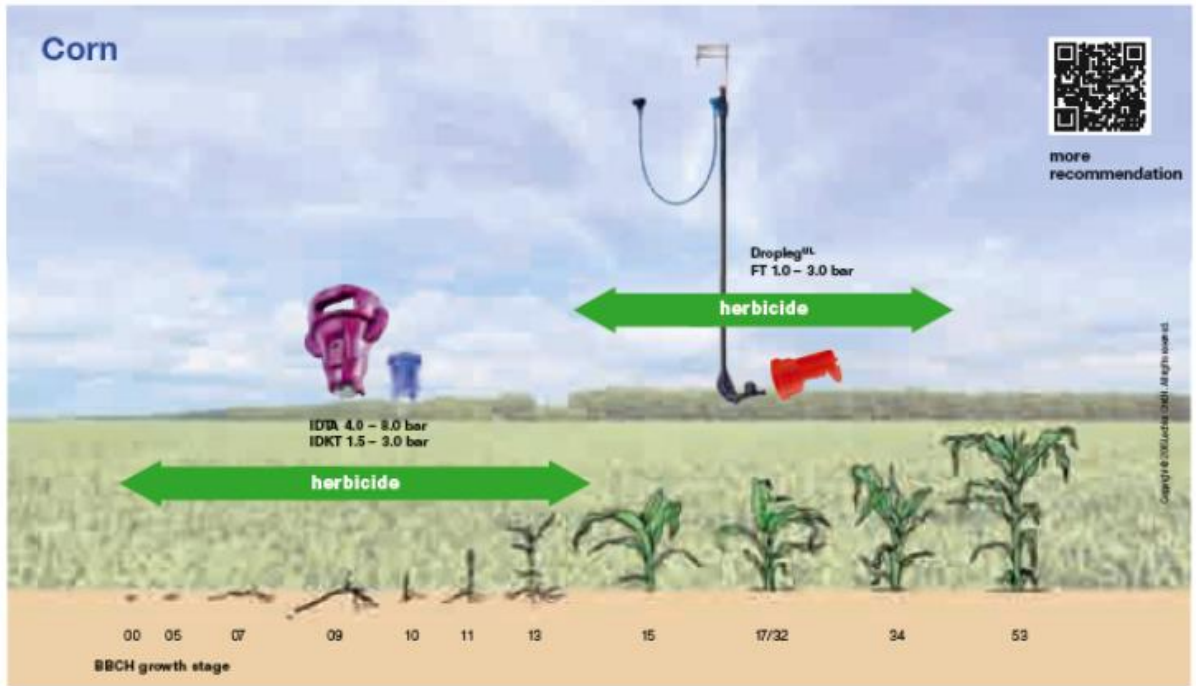
SUMMARY: Roundup Ultra Max alone (without additive) applied with Flat Fan nozzles controlled 96% of giant foxtail at 28 days after treatment (DAT). Giant foxtail control was reduced by 14 to 21% when Roundup Ultra Max plus 30% polyacrylamide at 4 oz/100 gal was applied with Turbo Teejet or Air Induction nozzles, respectively. Similarly, giant foxtail control was reduced 8% when Roundup Ultra Max plus HPG at 0.5 lb/100 gal was applied with Air Induction nozzles. The use of drift reducing additives or drift control nozzles with Roundup Ultra Max did not reduce control of velvetleaf, ivyleaf morningglory, and common cocklebur at 28 DAT. However, common ragweed control was reduced slightly when 30% polyacrylamide at 2 oz/100 gal or HPG at 0.25 lb/100 gal was added to Roundup Ultra Max applied with Drift Guard nozzles.

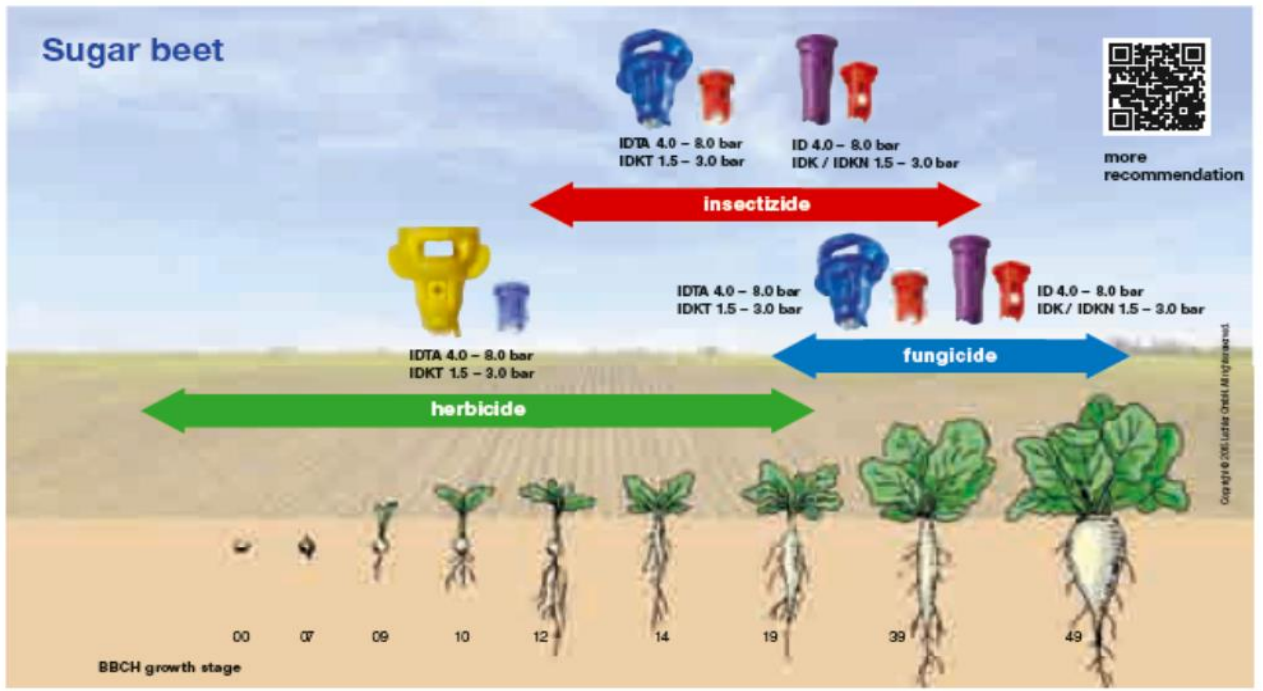
In plots treated with Roundup Ultra Max alone, soybean yield was not affected by nozzle type. Soybean yield was reduced by 8 bu/A when 30% polyacrylamide at 4 oz was added to Roundup Ultra Max applied with Air Induction nozzles. The addition of a drift reducing additive to Roundup Ultra Max applied with Flat Fan, Turbo Teejet, or Drift Guard nozzles did not reduce soybean yield.

Ponudniki šob so pričeli podajati informacije o pozicioniranju tipov šob in ustreznem pretočnem razredu – prim. LECHLER









PRAKTIČNI NASVETI

Čim manj krat škropimo v vetrovnih razmerah (USTREZNA ORGANIZACIJA DELA IN OPRAVIL).

Če smo primorani škropiti v vetrovnih razmerah vsaj na prvih 50 m od roba njive uporabimo pravilo, da za vsakih dodatnih 0,5 m/s hitrosti bočnega vetra premer (VMD) kapljic povečamo za 50 μm, začenši pri izhodišču 250 μm in hitrosti en m/s.

Takšna oblika pravila omogoča varnost tudi pri bolj nevarnih herbicidih (npr. glifosat, 2,4-D, klomazon, ….).

V vetrovnih razmerah nekoliko povečamo porabo vode in uporabimo šobe z dvojnim curkom ali pa šobe z zamaknjenim curkom in dodamo primerno močilo.

NA NASLEDNJI PROSOJNICI PRIMERI PRILAGODITVE BREZ VETRA / VETROVNO

PRIMERI PRILAGODITVE TIPA ŠOBE IN PORABE VODE (LE-LECHLER, AL – ALBUZ, TJ – TEEJET)

POVEČANJE VMD JE PRILAGOJENO NEVARNOSTI HERBICIDA ZA OKOLICO IN NE ZMANJŠA UČINKOVITOSTI HERBICIDA

	Ugodne razmere, veter pod 2,5 m/s VOŽNJA 7 KM/HA				Neugodne razmere, veter med 2,5 – 3,5 m/s VOŽNJA 8 KM/H (hitrost + 1 m/s → VMD + 50)			
	Šoba	Tlak (BAR)	VMD µM	l/ha	Šoba	Tlak (Bar)	VMD µM	l/ha
A, A*	LE LU 12003	3	185	200	LE IDKT TWIN AI 12005	3	370	290
B, B*	AL AXI 110015	4	120	140	AL AVI TWIN 11003	6	280	180
C, C*	TJ XR 11004	4	300	240	TJ AI TW J 11006	4	530	400
D, D*	TJ XR 110025	2,5	140	150	TJ TT WJ 11003	4	350	200

A – SULFONILSEČNINA, VETER POD 2,5 M/S, ŠIROKOLISTNI PLEVELI 2 DO 3 LISTE, 20 % TRAV

A* - SULFONILSEČNINA, VETER MED 2,5-3,5 M/S, ŠIROKOLISTNI PLEVELI 2 DO 3 LISTE, 20 % TRAV + DODAMO NEIONSKO ALI SILIKONSKO OMOČILO

B – FOP ALI DIM, VETER POD 2,5 M/S, PREVLADUJEJO OZKOLISTNI PLEVELI 2 DO 4 LISTE,

B* - FOP ALI DIM, VETER MED 2,5-3,5 M/S, PREVLADUJEJO OZKOLISTNI PLEVELI 2 DO 4 LISTE, + + DODAMO NEIONSKO MOČILO ALI PA OLJE, METILIRANO OLJE ALI OLJE Z LECITINOM

C – HORMONSKI HERBICID ALI GLIFOSAT, VETER POD 2,5 M/S, ŠIROKOLISTNI PLEVELI 8 DO 15 LISTOV, MALO TRAV

C* - HORMONSKI HERBICID ALI GLIFOSAT, VETER MED 2,5-3,5 M/S, ŠIROKOLISTNI PLEVELI 8 DO 15 LISTOV, MALO TRAV + DODAMO NEIONSKO ALI SILIKONSKO OMOČILO

D – FOP + bentazon (npr. SOJA), VETER POD 2,5 M/S, MEŠANICA OZKOLISTNIH IN ŠIROKOLISTNIH PLEVELOV MED 3 IN 5 LISTOV

D*- FOP + bentazon (npr. SOJA), VETER MED 2,5 – 3,5 M/S, MEŠANICA OZKOLISTNIH IN ŠIROKOLISTNIH PLEVELOV MED 3 IN 5 LISTOV + RASTLINSKO OLJE + MALO NEIONSKEGA OMOČILA

Uporabljajmo znanje, da nas ne driftne iz polja agro-gospodarskih subjektov!!!!!!!!!!!

