



LI 700, Spray pH and its Effect on Pesticide Performance

Have you ever used a pesticide, or had someone apply one for you and it did not control the pest? You may have attributed the poor control to weather conditions, the chemical itself, applicator error, pest resistance, or maybe you bought the wrong material. But have you ever thought to check the pH of the water used to mix the pesticide? The pH of the water that goes into your spray tank makes a difference in how effectively the pesticide works.

The characteristics of water used in a spray mix influence the effectiveness of some pesticides. One of the most important is the pH of the water, it's relative acidity or alkalinity. Water with a pH higher than 7 is alkaline. Many pesticides undergo a chemical reaction in the presence of alkaline water that reduces their effectiveness. The more alkaline the water, the more rapidly the pesticide breaks down. The severity of the reaction is determined by:

- the susceptibility of the pesticide,
- the amount of time the pesticide is in contact with the alkaline water,
- the temperature of the diluted pesticide mixture, and
- the level of alkalinity (pH) of the water.

How will I know if a spray should be buffered? Pesticides can break down very fast when the pH of the water is greater than 8 or 9. Some pesticides begin to break down as soon as they are combined with alkaline water in the tank. As a consequence, the active ingredients start to change to inactive ingredients before the pesticide ever leaves the tank. The degree of pest control may be somewhat to greatly decreased or even lost completely.

LI 700 pH Adjuster is a buffering-acidifying agent that changes the pH of a spray solution and keeps it there. LI 700 also acts as a penetrating surfactant, deposition aid and drift reduction agent.

How much LI 700 should be used? That depends on the pH of the water and the volume of water of the mixture. First determine the pH of the water. Then add LI 700 to the spray water before adding the pesticide.

- For highly alkaline water, pH 8 or higher, use 625 mL to 1.25 L LI 700 in 1000 L spray mixture.
- For mildly alkaline water, pH 6.5 to 8, use 300 to 625 mL LI 700 per 1000 L spray mixture.

Adding LI 700 to the spray mixture is an easy and economical way to guarantee maximum results from your pesticide application.

For further information see the attached "Product Response to Spray Solution pH" handout.

Always read the complete label before using any chemical.
Visit www.uap.ca for more information on LI 700



PRODUCT RESPONSE TO SPRAY SOLUTION pH



SPRAY SOLUTION MAY BE ACIDIFIED WITH LI 700

Effective: July 31, 2009

Supersedes: All Previous

Chemical / Technical Name	Common / Trade Name	Comments / Rate of Hydrolysis Time for 50% to Decompose (T _{1/2})	Reference / Source
I. Insecticides, Nematicides, Acaricides, and Miticides			
Acephate	Orthene	pH 3 = 30 days, pH 9 = 2.5 days	5,15
Azinphos-methyl	Sniper, Guthion	pH 5 = 17.3 days, pH 7 = 10 days, pH 9 = 12 hrs	4
Bacillus Thuringiensis	Bioprotec. Dipel, Vectobac, Foray	Stable at pH 4 and 7; unstable in pH above 8.	14, 16
Carbaryl	Sevin, Sevin XLR	pH 7 = 12 days, pH 9 = 3.2 hrs. Do not use in water with pH over 8 unless buffer is added	5,9,15
Carbofuran	Furadan	pH 6 = 200 days, pH 7 = 40 days, pH 8 = 5 days, pH 9 = 78 hrs, performs best at a pH of 4 to 6	7
Chlorpyrifos	Pyrinex, Pyrate, Dursban, Lorsban, Nufos	pH 4.7 = 63 days, pH 6.9 = 35 days, pH 8.1 = 22 days, pH 10 = 7 days, hydrolyzes by strong alkalis, stable in neutral and in weak acidic solutions. Avoid alkaline materials.	7,9,12
Clofentezine	Apollo	pH 9.2 = 4.8 hrs, pH 7 - 34 hr, pH 5 - 248 hr	11,15
Cypermethrin	Cymbush	pH 9 = 35 hrs, easily hydrolyzes but more stable in acid than in alkaline solutions. Optimum stability = pH 4	7
Diazinon	Diazinon	pH 5 = 31 days, pH 7.5 = 185 days, pH 9 = 136 days, more stable near neutral, avoid extreme acid conditions	5
Dichlorvos	DDVP	pH 7 = 8 hrs	1
Dicofol	Kelthane	Compatible with all but highly alkaline pesticides. No degradation in 20 days at pH 5. pH 7 = 5 days, pH 10 - 15 min	7,12
Dimethoate	Lagon, Cygon	pH 2 = 21 hrs, pH 6 = 12 hrs, pH 9 = 48 min, presence of iron accelerates decomposition	5
Endosulfan	Thionex, Thiodan	Undergoes some degree of alkaline, 70% loss after 7 days at pH 7.3 to 8.0	5,12
Formetanate	Carzol	pH 5 = 4 days, pH 7 = 14 hrs, pH 9 = 3 hrs	8
Malathion	Malathion	Hydrolyzes rapidly in water above pH 7 and below pH 5. Iron will catalyze decomposition. pH 6 = 7.8 days, pH 7 = 3 days, pH 8 = 19 hrs, pH 10 - 2.4 hrs	1,12
Methomyl	Lannate	pH 9.1 = loss of 5% in 6 hrs, stable in slightly acidic solutions. Do not use in highly alkaline mixtures. pH 6 = 54 wks, pH 7 = 38 wks, pH 8 = 20 wks	5,9,12
Naled	Dibrom	Over 90% hydrolyzes in 48 hrs in alkaline aqueous solutions. Stable below pH 7.	1, 16
Oxamyl	Vydate	Stable at pH 4.7, 3% loss in 24 hrs at pH 6.9, 45% loss in 24 hrs at pH 9.1 (pH 7 = 8 days, pH 9 = 3 hrs)	12,15
Permethrin	Pounce	Optimum stability pH 4	14
Phosalone	Zolone	Hydrolyzes rapidly in alkaline medium, stable at pH 5 to 7, pH 9 = 9 days	1,12
Phosmet	Imidan	pH 4.5 = 13 days, pH 7 = 12 hrs, pH 8.3 = 4 hrs, pH 10 = 1 min. Activity may be reduced when pH is above 7. Correct pH with buffering or acidifying agent.	1,9,12



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II. Fungicides			
Fosetyl-Al	Aliette	PH 3.9 to 4.2 for maximum stability.	16
Chlorothalonil	Bravo, Daconil	PH 7 or lower is stable; pH 9 38 days.	16
Cymoxanil	Curzate	Stable at pH 2-7.3	15
Dithiocarbamates EBDC	Penncozeb, Dithane	Stable in neutral or slightly acid solutions.	16
Dodine	Equal	Not compatible with lime or chlorobenzilate	2
Iprodione	Rovral	Chemical breakdown may occur in water with high pH (pH 7 = 1-7 days, pH 9 < 1 hr)	9,15
Metalaxyl	Ridomil	pH 9 = 88 days; stable at pH 7 and below.	16
Propiconazole	Bumper, Mission, Banner, Topas, Tilt	Most effective in pH 5 to 9; use within 12 to 16 hours.	16
Thiophanate-Methyl	Senator	Do not combine with high alkaline materials; pH 4.5 to 7.5 for optimal effectiveness.	9, 16
III. Plant Growth Regulators			
Chlormequat Chloride	Cycocel	pH 5 to 6 for optimal effectiveness.	16
Daminozide	B-Nine, Kylar	Do not use with alkaline materials	3
Ethephon	Ethrel	Very stable at pH 3 or less, incompatible with alkaline salt	2
Gibberellic Acid	Pro Gibb, Gibberellin, Activol, Apogee	Hydrolyzes slowly by water, should not be combined with alkaline materials	2
Gibberellic Acid	Promalin	A buffered wetting agent should be used, final spray should not exceed pH 8	2
IV. Herbicides			
Atrazine	Atrazine, Aatrex	Decomposes slowly in alkaline solution and more rapidly if lime is present	6
Bromoxynil	Badge, Bromotril, Buctril, Mextrol, Koril	Subject to hydrolysis above pH 7.	16
Clethodim	Arrow, Select, Centurion	Not stable to extremes of pH; pH 6 to 8 for optimum effectiveness.	15, 16
Clodinafop	Horizon	pH 7 = 8.1 hrs, pH 9 = 2.5 hrs	15
Clomazone	Command	Most effective in pH of 4.5 to 9.	16
Clopyralid + MCPA	Curtail M	PH 7 to 7.5 for optimal effectiveness.	16
Dicamba	Oracle, Banvel , Vanquish	Stable at pH 5 to 6.	16
Diclofop	Hoegrass	pH 7 = 32 days, pH 9 = 12 hrs	15
Difenzoquat	Avenge	Stable at a low pH, alkaline conditions cause precipitation	13
Diquat	Reglone, Reward	Stable in neutral or acid solutions, but decomposes in alkaline conditions, unstable with a pH > 9	2,13





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IV. Herbicides			
Diuron	Diurex, Karmex	Stable in neutral pH.	16
Glyphosate	Glyfos, Roundup, + others	Reported to have an optimum pH of 2.5, alkaline conditions should be avoided	11
Imazapyr	Arsenal	Decomposes rapidly under alkaline conditions. Most effective at pH 7.	16
Metasulfuron Methyl	Ally	Avoid pH less than 3; apply within 24 hours to avoid degradation.	16
Metribuzin	Sencor	Stable at pH 5 to 8.5.	16
Naptalam	Alanap	Hydrolyzes in solutions with a pH greater than 9.5	13
Nicosulfuron	Accent	Apply within 24 hours to avoid degradation; agitate thoroughly if left standing.	
Oxyfluorfen	Goal	Stable in neutral pH.	16
Paraquat	Gramoxone	Stable in acid or neutral conditions, readily hydrolyzed in alkaline media	13
Pendimethalin	Prowl	pH 6 to 7 is optimum effectiveness.	16
Phenmedipham Desmedipham (50-50 mixture)	Betamix	Undergoes hydrolysis under alkaline conditions, pH 7 = 5 hrs, pH 9 = 10 minutes	16
Primisulfuron	Beacon	Most effective in pH 4 to 9; avoid pH less than 4.	16
Sethoxydim	Poast	pH 3 to 4 for optimum effectiveness.	16
Simazine	Princep	Decomposes slowly in alkaline solution and more rapidly if lime is present	6
Trifluralin	Bonanza, Treflan. Rival	pH 5 to 9 for optimum effectiveness.	16
V. Antibiotics			
Streptomycin Sulfate	Streptomycin 17,	Avoid use with alkaline materials. For high alkaline water sources, use of an acceptable acidifying agent may be advisable to bring tank solution to a normal or slightly acid pH.	10



**THE INFORMATION IN THIS TECHNICAL BULLETIN HAS BEEN COLLECTED AND
COMPILED FROM SEVERAL SOURCES.**

THE ACCURACY OF THE INFORMATION HAS NOT BEEN VERIFIED BY LOVELAND PRODUCTS, INC.
Always read the complete label before using any chemical.

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3. Plant Growth Regulator Handbook, 1st edition, Plant Growth Regulator Working Group, 1977.
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5. North Dakota Insect Control Guide, North Dakota State University, Cooperative Extension Service.
6. "pH Effect on Pesticides", Miller Chemical & Fertilizer.
7. "The Effect of pH on Pesticides", Diad Agricultural Services, Ltd.
8. Technical Information, Carzol, Morton Chemical Company.
9. Crop Protection Chemicals References, 5th Edition, Chemical & Pharmaceutical Press, 1989.
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11. "Pest-Asides", No. 3, Western Australia Department of Agriculture, February 1987.
12. "Preventing Decomposition of Agriculture Chemicals by Alkaline Hydrolysis in the Spray Tank", A.J. and H.Riedl, New York Food and Life Sciences Bulletin.
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