

EVALUATION OF HERBICIDE AND ADJUVANT PHYSICAL COMPATIBILITY

Annual Report For FFY 2011
ODOT SP&R ITEM NUMBER 2157

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December 2011

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MODERN METRIC CONVERSION FACTORS*

APPROXIMATE CONVERSIONS TO SI UNITS				
SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in²	square inches	645.2	square millimeters	mm ²
ft²	square feet	0.093	square meters	m ²
yd²	square yard	0.836	square meters	m ²
A	acres	0.405	hectares	ha
mi²	square miles	2.59	square kilometers	km ²
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft³	cubic feet	0.028	cubic meters	m ³
yd³	cubic yards	0.765	cubic meters	m ³
NOTE: volumes greater than 1000 L shall be shown in m ³				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	newtons	N
lbf/in²	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS				
SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
mm²	square millimeters	0.0016	square inches	in ²
m²	square meters	10.764	square feet	ft ²
m²	square meters	1.195	square yards	yd ²
ha	hectares	2.47	acres	A
km²	square kilometers	0.386	square miles	mi ²
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m³	cubic meters	35.314	cubic feet	ft ³
m³	cubic meters	1.307	cubic yards	yd ³
MASS				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
TEMPERATURE (exact degrees)				
°C	Celsius	1.8C+32	Fahrenheit	°F
ILLUMINATION				
lx	lux	0.0929	foot-candles	fc
cd/m²	candela/m ²	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS				
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in ²

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

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1.0 INTRODUCTION

The Oklahoma Department of Transportation (ODOT) Roadside Vegetation Management program uses a dynamic, adaptive approach, providing fiscal and environmentally responsible management of Oklahoma rights-of-way. ODOT's integrated roadside vegetation management (IRVM) strategy incorporates mechanical, cultural, and biological practices in addition to herbicides to effectively manage roadside vegetation.

Herbicides are a vital component of ODOT's IRVM strategy and will likely stay that way for the foreseeable future. The U.S. Environmental Protection Agency (US EPA) regulates pesticide registration in the U.S. and along with the Oklahoma Department of Agriculture, Food, and Forestry (ODAFF), directly and indirectly control the availability of herbicides for vegetation managers in Oklahoma. Currently the US EPA and ODAFF do not regulate pesticide adjuvants sold separately from or as a part of the pesticide formulated products. Adjuvants are products that improve the performance characteristics of a pesticide and/or its application. An example of an adjuvant used often by ODOT would be the product Detain II. Detain II (1) is a deposition aid and drift retardant. ODOT uses Detain II to improve herbicide spray characteristics. It achieves this by decreasing the number of small spray particles of 100 microns or less in diameter and thus reduces the likelihood of "off-target particle drift."

The lack of close regulation of adjuvants as well as the lack of published data on the physical compatibility of herbicide's and adjuvants allows for possible unknown physical tank mix incompatibilities to exist. Compatibility testing of herbicide/adjuvant tank mix partners helps the ODOT guard against unidentified and potentially costly issues of physical incompatibility between new or reformulated herbicides and adjuvants.

Adverse consequences of physical incompatibility can include settling, layer formation, globule formation or formation of precipitants. If these issues occur, they can damage or clog sprayer components. Incompatible mixes may even affect an herbicide's performance in terms of weed control. In the event of a tank mix of incompatible herbicides and adjuvants, the applicator would then have to deal with disposal of the material in a legal manner. Applying the incompatible mixture to the roadside may not be an option if sprayer components are clogged or if the incompatible mixture cannot be accurately applied. This may result in ODOT being forced to dispose of the tank mix as a hazardous waste material. Obviously the latter option is very undesirable.

The Oklahoma State University Roadside Vegetation Management (OSU-RVM) Program is under contract by ODOT to annually test the physical compatibilities of new herbicide's and adjuvants intending to be added to the *ODOT Approved Herbicide and Adjuvant List* (AHAL). The intent of this effort is to place only those new products on the AHAL that have proven tank mix compatibility. This ultimately will prevent ODOT

herbicide applicators from being in the position of dealing with a tank of incompatible herbicide waste in the future. As long as ODOT continues to only use those herbicides and adjuvants that are on the current AHAL and provided suitable tank agitation is present, we are confident there should be no tank mix physical incompatibility issues.

2.0 PROBLEM STATEMENT

In 2011 there were no new or generic herbicides in need of physical compatibility testing for ODOT. However, based on the problems that ODOT has experienced for the past several years with Detain II Drift Control additive it was decided by the OSU RVM program to find an alternative drift control additive that would better suit ODOT needs. For many years Detain II has successfully supplied ODOT crews with a low-cost drift management tool. However, Detain II has been a product that was difficult to handle and use. Detain II has a short shelf life of 6 months based on the experiences of the ODOT and OSU RVM personnel. At some point after the approximate 6 month shelf life, the contents of the quart containers undergo separation of the polymers and emulsifiers. Once complete separation occurs the product is extremely difficult to remix and is essentially rendered useless. Attempts to use the separated Detain II in a tank of herbicide and water will normally result in globules of Detain II clogging in-line screens. The subsequent sprayer system cleaning processes are very involved and difficult requiring more than a simple water flushing and cleanout. The short shelf life of Detain II makes it very difficult to maintain appropriate inventories of this product by ODOT crews. Because of these difficulties it was appropriate to find a replacement for Detain II.

Since Detain II has been the low-bid liquid drift control product for many years and it has been communicated to the OSU RVM Team that ODOT is the only user of Detain II it was important that a suitable alternative be found before its manufacture was discontinued. In 2010 alternative products were investigated, reviewed, and discussed with adjuvant manufacturers and distributors. A major consideration when finding a quality drift control alternative to Detain II was to make certain that any new product would be able to supply ODOT with better handling and mixing characteristics, good particle drift control abilities, as well as it being compatible with current ODOT herbicides.

3.0 PURPOSE OF RESEARCH

The purpose of this research was to test the physical compatibility of Control™ Deposition Aid/Drift Retardant (2) and Corral® Poly Drift Control Agent and Deposition

Aid (3) [Figure 1] when mixed with selected ODOT herbicides. The goal of this testing was to find alternatives to Detain II for inclusion on the *ODOT Approved Herbicide and Adjuvant List* and subsequently replace Detain II. Both products that were investigated are used at much lower product use rates and have potentially lower cost per acre. Additionally, each appear to have a shelf life of at least 1 year based on communications with various industry personnel. Once tested for compatibility, each of these products could provide several benefits to ODOT personnel whom manage purchasing, inventories, as well as use drift control products at both the division and county/interstate levels within ODOT.



Figure 1. Quart containers of Control™ deposition aid/drift retardant and Corral® Poly drift control agent and deposition aid.

4.0 STUDY OBJECTIVES

Using an industry standard jar test, the specific objectives of this research were to test the physical compatibility of selected treatments of:

- i) Control™ (Polyvinyl Polymer (Polyacrylamide) with selected herbicide treatments.
- ii) Corral® Poly (Polyvinyl Polymer (Polyacrylamide) with selected herbicide treatments.

5.0 MATERIALS AND METHODS

This research was conducted on 19 September 2011 from 9:30 to 2:30 p.m. at the Turfgrass Research Center located at the Oklahoma Botanical Garden, Oklahoma State University, Stillwater, OK. Selected treatments of Control™ and Corral® Poly were investigated for physical compatibility with selected herbicide treatments (Table 1, Figure 1). Control™ and Corral® Poly are Polyvinyl Polymer drift control additives that when used properly can help reduce the potential for off-target particle drift. Using some type of drift control product is very important in all broadcast herbicides applications and required under ODOT Policy No. D-504-1 [effective 1-31-2011] (4). By this policy, a drift control product must be used in each broadcast or powered handgun herbicide application made by ODOT personnel.

A tank mix carrier rate of 30 gallons per acre (GPA) was used in this test for all treatments. The 30 GPA carrier rate is commonly used by many ODOT personnel for making broadcast herbicide applications. An industry standard jar test method was used for tank mix compatibility testing (5). Clear, clean, unused 1-liter soda bottles were filled with 500 ml of deionized water (Figure 2). The deionized water had a pH of 6.6 with minimal amounts of cations and anions present (Appendix C). The lack of calcium and magnesium resulted in classification of this carrier as “soft” (6). The appropriate herbicide amounts and Surf-King Plus Non-ionic Surfactant (7), if required, were added to each bottle to represent OSU recommended broadcast herbicide treatment rates for these specific herbicides and manufacturer recommended rates for Control™ and Corral Poly®. Specific herbicide treatments and treatment rates are listed in Table 1. Specific drift control product rates are listed in Table 2.

Laboratory experimental conditions were maintained under relatively controlled environmental conditions where the mean air temperatures were 75-80 °F and deionized water temperatures were 81-84 °F. Air and water temperatures were measured with a calibrated mercury in glass thermometer and read to the nearest 1.0 °F.



Figure 2. 2011 Herbicide and adjuvant compatibility testing set-up at the OSU Turfgrass Research Center in Stillwater.

Treatments were evaluated at three separate stages (see Appendix D) to determine if any physical incompatibilities were produced and sustained. Once all herbicide/adjuvant components were mixed properly initial evaluations were made immediately after the initial mixing, followed by evaluations at 30 minutes after initial mixing but prior to remixing. Final evaluations were taken immediately after remixing. Four questions were asked at each stage of the evaluation (see Appendix E) to assess any visual physical incompatibilities. The visual physical incompatibilities assessed were: formation of precipitates, layering, flocculation and foaming. Bottles were backlit with a light source to make incompatibilities more evident, if present. The experiment was designed as a Randomized Complete Block with 2 replications of treatments.

Table 1. Herbicide and adjuvant treatments evaluated for physical compatibility during 2011 testing.¹

Treatment Number & Product Names		Form Conc ¹	Form Unit	Form Type	Rate	Rate Unit	Carrier Rate
1	Landmaster BW	3.1	lb ai/gal	L	32	fl oz/a	30
	Ammonium Sulfate	99	%	SG	17	lb/100 gal	
2	Roundup Pro Concentrate	5	lb ai/gal	L	32	fl oz/a	30
3	Ranger Pro	4	lb ai/gal	L	32	fl oz/a	30
4	Roundup Pro Concentrate	5	lb ai/gal	L	13	fl oz/a	30
	Oust Extra	71.25	%	WG	1.5	oz/a	
5	Roundup Pro Concentrate	5	lb ai/gal	L	13	fl oz/a	30
	Outrider	75	%	WG	1	oz/a	
6	Vanquish	4	lb ai/gal	L	32	fl oz/a	30
	Non-ionic surfactant	90	%	L	0.25	% v/v	
7	Transline	3	lb ai/gal	EC	8	fl oz/a	30
	Non-ionic surfactant	90	%	L	0.25	% v/v	
8	Arsenal	2	lb ae/gal	L	64	fl oz/a	30
	Non-ionic surfactant	90	%	L	0.25	% v/v	
9	Prodiamine 65 WDG	65	%	WDG	2.3	lb/a	30
10	Perspective	55.3	%	DF	4.75	oz/a	30
	Non-ionic surfactant	90	%	L	0.25	% v/v	
11	Streamline	52.1	%	DF	4.75	oz/a	30
	Non-ionic surfactant	90	%	L	0.25	% v/v	
12	Garlon 4 Ultra	4	lb ai/gal	EC	96	fl oz/a	30
	Tordon K	2	lb ai/gal	SC	32	fl oz/a	
	Non-ionic surfactant	90	%	L	0.25	% v/v	
13	Krenite S	4	lb ai/gal	SC	128	fl oz/a	30
	Crop oil concentrate	90	%	L	1	% v/v	
14	Milestone VM	2	lb ai/gal	SC	4	fl oz/a	30
	Non-ionic surfactant	90	%	L	0.25	% v/v	
15	Roundup Pro Concentrate	5	lb ai/gal	L	10	fl oz/a	30
	Plateau	2	lb ai/gal	SC	4	fl oz/a	

¹Form = Formulation, Conc = Concentration, lb ai = pounds of active ingredient, lb ae = pounds of acid equivalent, gal=gallons, fl oz = fluid ounces, v=volume of product to volume of water ratio, a = acres. L=liquid, SG=soluble granule, WG=wettable granule, EC=emulsifiable concentrate, WDG=water dispersible granule, DF=dry flowable, and SC=soluble concentrate.

Table 2. Selected drift control products, rates, and carrier rates evaluated for physical compatibility with selected odot herbicides and herbicide combinations¹.

Treatment Number & Product Names		Active Ingredient Concentration by Weight (%)	Formulation Type	Product Use Rate	Spray Carrier Rate
1	Control™	37	L	1 fl oz/100 gal	30
2	Corral® Poly	30	L	2 fl oz/100 gal	30

¹L=liquid, fl oz = fluid ounces, gal = gallon.

6.0 RESULTS

During the 2011 compatibility testing the Control™ adjuvant proved to be compatible with all herbicides and herbicide combinations tested (Table 1). The Corral® Poly adjuvant had moderate to severe physical incompatibilities with Prodiamine 65 WDG but was otherwise compatible with all other herbicides. When Prodiamine 65 WDG was combined with the Corral® Poly adjuvant, moderate to severe physical incompatibilities occurred (Figure 3). The physical incompatibilities were in the form of moderate to severe flocculation (to cause dispersed particles to mass in a group) followed by settling and eventually the formulation of a heavy mass of large flocculated particles. Prodiamine 65 WDG is a dry herbicide formulation that when added to water will disperse and form a homogeneous suspension provided that normal tank agitation is provided. However, if agitation is marginal or not existent, settling of the dispersed particles will occur. Once settled, re-suspension may be difficult but can usually be achieved with adequate agitation over several minutes. The incompatibility that occurred in this test between Prodiamine 65 WDG and Corral® Poly at 2.0 oz/100 gallon carrier rate appeared to permanently and irreversibly change the ability of Prodiamine 65 WDG to disperse and to remain dispersed properly in water. The severity of the incompatibility would likely cause clogging of sprayer components (i.e. 50 mesh screens, electric shut-off valves, electric pressure control valves, small spray tips, etc.) and would likely affect the proper distribution of this herbicide during the application.



Figure 3. Incompatible mixture of Prodiamine 65 WDG and Corral® Poly (bottle on far left) and the compatible Control™ mixture in the far right bottle. Bottle in the middle is a controlled check with only Prodiamine 65 WDG.

7.0 DISCUSSION

Our testing can be considered to represent a conservative approach. We are confident that this testing method would detect incompatible tank mix combinations that would be problematic to the ODOT RVM Managers. Provided that labeled directions are followed and characteristics of water carrier sources are not extreme, we do not feel that the Control™ Deposition Aid/Drift Retardant when used at the highest labeled rate of 1.0 oz./100 gallon carrier rate with herbicides and herbicide combinations tested in Table 1 will cause any physical incompatibility problems for ODOT personnel.

Corral® Poly should not be mixed and used with Prodiamine 65 WDG as such mixes are physically incompatible (Table 1 and Figure 3) and will produce moderate to severe mixing and application problems for ODOT personnel. The other herbicides and tank mixes that ODOT commonly uses and that were tested in this trial (Table 1) will not likely cause problems with Corral® Poly Drift Control Agent and Deposition Aid at 2.0 oz./100 gallon carrier rate. This is contingent upon the characteristics of the water carrier sources not being extreme and that ODOT personnel follow labeled directions.

8.0 CONCLUSIONS

1. Use of all herbicides and herbicide combinations tested (Table 1) with Control™ Deposition Aid/Drift Retardant at 1.0 oz./100 gallon of water are not expected to create any tank mix combination that are unusable as long as labeled directions are followed and characteristics of water carrier sources are not extreme.
2. The labeled use rate of Corral® Poly at the 2.0 oz./100 gallon of water was found incompatible with Prodiamine 65 WDG. Otherwise, herbicide tank mixes commonly utilized by ODOT that were tested in this trial (Table 1) were found compatible with the Corral® Poly 2.0 oz./100 gallon of water labeled use rate. Compatible tank mixes are those that are useable and that are not expected to create any hazardous waste requiring special disposal measures for ODOT pesticide applicators as long as labeled directions are followed and characteristics of water carrier sources are not extreme. The Corral® Poly and Prodiamine 65WDG combination may create an incompatible mixture in the field. This incompatibility may result in an unusable spray mixture that could clog the spray system and possibly damage spray equipment. This incompatible mix might also cause erratic weed control results if applied. Finally, creation of such a mix if unusable may create hazardous waste requiring special disposal measures if equipment became clogged or applications could not be made as per label directions.

9.0 LIMITATIONS ON CONCLUSIONS

Our compatibility testing is only for physical incompatibility that can be detected via a visual industry standard jar test (5). ODOT herbicide applicators are required to read all herbicide label information concerning water carrier issues and to be familiar with the water source they are using. ODOT applicators can reference the OSU RVM Programs report *2005 Evaluation of ODOT Water Quality Characteristics for Suitability in Herbicide Spray Applications* (8) to determine specific characteristics of water sources tested. Additionally, we encourage periodic testing of water sources, especially if water sources change from previous sources.

10.0 RECOMMENDATIONS

Considering the positive compatibility results, the OSU-RVM Program will formally recommend that both Control™ and Corral® Poly (with the Prodiamine 65 WDG use restriction) be included in the next *ODOT Approved Herbicide & Adjuvant List (AHAL)* that is produced. Because of the resulting incompatibilities between Prodiamine 65 WDG and Corral® Poly at the 2 oz./100 gallon of water carrier rate we cannot

recommend that ODOT use Prodiamine 65 WDG herbicide with Corral® Poly. However Corral® Poly can be effectively used with all other herbicides and herbicide combinations tested thus far (Table 1). We also recommend the end user read the section of this report on “LIMITATIONS ON CONCLUSIONS” as well as read and follow all product label directions.

11.0 REFERENCES

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APPENDIX A

CONTROL™ DEPOSITION AID/DRIFT RETARDANT LABEL

CONTROL™

DEPOSITION AID/DRIFT RETARDANT

INGREDIENTS:

Polyvinyl Polymer (Polyacrylamide)	37%
Formulation aids and inert	63%
TOTAL	100%

All ingredients are exempt from tolerance requirements under 40 CFR 180.1001 (d)

GENERAL INFORMATION

CONTROL™ is a research proven, effective, easy-to-use adjuvant for increasing deposition which results in less spray drift in pesticide applications. CONTROL™ is compatible with most water soluble pesticides and mixes extremely well with water. With Roundup® Weather Max™, Original Max™, and Power Max™ you must use 8.5-17 lbs./100 gal. of ammonium sulfate for compatibility. CONTROL™ works well at increasing deposition of nitrogen solutions.

CAUTION

May cause skin and eye irritation
Avoid eye and skin contact
Do not take internally

KEEP OUT OF REACH OF CHILDREN

NET CONTENT: 1 Quart (.95 liters)

GARRCO PRODUCTS, INC.

P.O. Box 619

Converse, IN 46919-0619

Phone: 765.395.3441

Web Site/MSDS: www.garrco.com

32 oz.
20 7

30 oz.
20 9

28 oz.
20 8

26 oz.
20 01

24 oz.
20 21

22 oz.
20 71

20 oz.
20 91

18 oz.
20 81

16 oz.
20 22

14 oz.
20 22

12 oz.
20 42

10 oz.
20 92

8 oz.
20 28

6 oz.
20 08

4 oz.
20 28

DIRECTIONS

- CONTROL™ is compatible with most pesticides. With Weather Max™, Original Max™, and Power Max™, first add AMS at 8.5-17 lbs./100 gal. for compatibility, then CONTROL™, then either "Max™" version
- Small spraying systems, low pressures, and/or drift reducing nozzles require low use rates (½-2 oz./100 gal.)
- Custom application equipment, and/or higher pressures require higher rates (1-3 oz./100 gal.)
- If unsure of proper rate, start with the lower rates and add in ½-1 oz./100 gal. increments until the desired effect is obtained.
- If too much of the polymer is added, a stringy appearance from the spray pattern will be noticed, dilution with water is the best solution. 10-34-0 fertilizer will break down the polymer.
- Always add CONTROL™ to the tank last, unless otherwise instructed by the pesticide manufacturer's label.

Always use agitation when adding CONTROL™ to the spray tank.

May be used in aquatic applications at labeled rates.

Aerial, roadside, and railroad right of way applications will normally require a rate of 1-3 oz./100 gal. If more is needed add at 1 oz./100 gal. increments until desired effects are achieved. After the initial trial, the final mix will stay constant unless volume, nozzle, and/or pressure changes are made. The new drift reducing nozzles (i.e. "Turbo" and "A.I." Types) may use 1 oz. or less.

SHAKE WELL BEFORE EACH USE

PRECAUTIONS

CONTROL™ must have 8.5-17 lbs./100 gal. AMS to allow proper mixing with all Roundup® "Max™" versions. However, a compatibility test should be used to determine individual water compatibility.

CONTROL™ will retard but not totally eliminate drift. Always follow pesticide directions and precautions.

CONTROL™ is not intended as a substitute for good agronomic practices. Common sense and sound application techniques must be used when spraying pesticides.

STORAGE AND DISPOSAL

Protect from freezing. Store above 32°F. Do not reuse empty container. Dispose of container in accordance with federal, state, or local regulations.

FIRST AID

Skin & Eyes - Flush with plenty of water. Consult a physician if irritation develops or persists.

Ingestion - Give plenty of water if conscious. Do not induce vomiting. Seek medical attention immediately.

Wear appropriate protection to avoid eye and skin contact.

Seller makes no warranty of fitness or merchantability. Buyer agrees that seller's maximum liability shall not exceed the purchase price of this product.

APPENDIX B

CORRAL® POLY DRIFT CONTROL AGENT AND DEPOSITION AID
LABEL



Corral[®] Poly

Drift Control Agent and Deposition Aid

For use with Pesticides and Fertilizers

PRINCIPAL FUNCTIONING AGENTS:

Polyvinyl Polymer (Polyacrylamide).....	30%
CONSTITUENTS INEFFECTIVE AS SPRAY ADJUVANT	70%
TOTAL	100.00%

All ingredients are exempt from tolerance requirements as specified in federal regulation
40 CFR 180.

STOP - READ LABEL BEFORE USING.

KEEP OUT OF REACH OF CHILDREN

WARNING

Hazards to humans and domestic animals: Harmful if absorbed through skin, swallowed, or inhaled. Causes skin and moderate eye irritation. Do not get on skin, in eyes, or on clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling. Remove and wash contaminated clothing before reuse.

Personal Protective Equipment: Wear chemical-resistant gloves, long-sleeved shirt and long pants, and shoes plus socks.

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a poison control center or doctor for treatment advice.

IF ON SKIN: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

IF SWALLOWED: Immediately call a poison control center or doctor immediately for treatment advice. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give any liquid to the person. Do not give anything by mouth to an unconscious person.

IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Contains petroleum distillate – vomiting may cause aspiration pneumonia.

USE PRECAUTIONS

The degree of drift hazard varies with the type of pesticides, application conditions, and vegetation near the sprayed area. Common sense and sound application technology must be followed when spraying pesticides. CORRAL POLY will retard but not totally eliminate drift.

WA Reg. No. 1381-09003

Distributed By:
Winfield Solutions, LLC
P.O. Box 64589, St. Paul, MN 55164-0589

NET CONTENTS
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STORAGE AND DISPOSAL

Storage: Store in original container only. Do not contaminate water, food, or feed by storage or disposal. Keep product in a closed container and do not allow contact with water until added to the spray solution during mixing.

Container Disposal: Do not reuse empty container. Triple rinse (or equivalent) during mixing and loading. Recycling decontaminated containers is the best option of container disposal. The Agricultural Container Recycling Council (ACRC) operates the national recycling program. Contact your state and local ACRC recycler or visit the ACRC web page at www.acrecycle.org. Decontaminated containers may also be disposed of in a sanitary landfill.

GENERAL INFORMATION

CORRAL POLY is an effective, easy-to-use adjuvant for deposition improvement and drift retardation in spraying operations. CORRAL POLY is designed for general use in standard ground and aerial applications and is fully compatible with a wide variety of spray configurations. Further, CORRAL POLY is compatible in tank mix applications with a broad spectrum of crop protection pesticides, including the complete range of all branded and generic glyphosate formulations.

DIRECTIONS FOR USE

For Terrestrial Use Only – Not For Aquatic Use

SHAKE BOTTLE WELL BEFORE USING. Dosages may be adjusted to compensate for environmental conditions or mechanical factors. For example, lower dosages generally may be used when spraying under calm winds, slow application speeds, low pressures, short release height, and for higher humidity. The greater the shear on the spray boom nozzle head, the greater the spray droplet fragmentation which produces fines (mists) which may drift to non targeted areas or evaporate and rise as smoke into the atmosphere. For best control results using this product in aerial application, use state-of-the-art techniques, such as pressure less than 45 psi and nozzles oriented 45 degrees back to straight back.

Mixing: This product is extremely concentrated and effective in mixing as low as 1 oz. per 100 gallons. Start with lower dosage and increase as needed. A thickened or "stringy" solution indicates that too much CORRAL POLY has been used.

1. Select proper dosage for the spraying operation.
2. Fill the mix tank with water, pesticide, fertilizer, surfactant and/or other additives and begin agitating.
3. Shake CORRAL POLY well before using.
4. For best results, either (1) inject CORRAL POLY liquid into the suction side of the feeder or recirculating pump to obtain adequate solution, or (2) slowly add CORRAL POLY liquid to the rapidly agitating tank mix to the areas of highest turbulence by pouring a thin stream through a pour space.
5. Continue to agitate the mix tank for at least 3 minutes before spraying.

Dosage:	Generally 1-8 ounces per 100 gallons of spray solution.
	Cone or raindrop nozzles 1-3 oz.
	Flat fan or flood nozzles 1-5 oz.
	Off center nozzles 2-6 oz.
	Spraygun (30-50 psi) 5-8 oz.

After use, flush and rinse spray system. Follow clean-up instructions on the pesticide label.

Notice of Warranty

Seller warrants that the product conforms to its chemical description and is reasonably fit for the purposes stated on the label when used in accordance with directions under normal conditions of use. SELLER MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, NOR IS ANY REPRESENTATIVE OF SELLER AUTHORIZED TO MAKE ANY SUCH WARRANTY OR MODIFY THESE TERMS. This warranty does not extend to the storage, handling or use of this product contrary to label instructions, or under abnormal conditions, or under conditions not reasonably foreseeable to Seller, and Buyer assumes the risk of any such storage, handling or use. Seller shall not be responsible for incidental or consequential damages, if any, resulting from a breach of warranty.

Corral® is a registered trademark of Winfield Solutions, LLC

APPENDIX C

DEIONIZED WATER ANALYTICAL LABORATORY REPORT



Soil, Water & Forage Analytical Laboratory

Oklahoma State University Division of Agricultural Sciences and Natural Resources
 045 Agricultural Hall
 Stillwater, OK 74078
 E-mail: soiltesting@okstate.edu
 Website: www.soiltesting.okstate.edu

WATER QUALITY REPORT

ROADSIDE VEGETATION MGMT PROGR...
 358 AG HALL
 STILLWATER, OK 74078

Name :
 Location :

Lab ID No.: : 608431
 Customer Code : 216
 Sample No. : 110722
 Received : 7/22/2011
 Report Date : 7/27/2011

Test Results for Irrigation Water

----- Cations -----		----- Anions -----		----- Other -----	
Sodium (ppm)	1	Nitrate-N (ppm)	<1	pH	6.6
Calcium (ppm)	1	Chloride (ppm)	0	EC (µmhos/cm)	9.3
Magnesium (ppm)	0	Sulfate (ppm)	1		
Potassium (ppm)	0	Boron (ppm)	<.01		
		Bicarbonate (ppm)	8		
----- Derived Values -----			----- Derived Values(cont'd) -----		
Total Soluble Salts (TSS in ppm)	11.4	Sodium Percentage		39.6 %	
Sodium Adsorption Ratio (SAR)	0.2	Hardness (ppm)		2.9	
Potassium Adsorption Ratio (PAR)	0	Hardness Class		Soft	
Residual Carbonates (meq)	0.1	Alkalinity (ppm as CaCO ₃)		6.8	

INTERPRETATION AND REQUIREMENTS FOR *Irrigation Water*

The total soluble salt and sodium content of this water are low enough that no problem should result from its use.

Signature

Oklahoma State University, U.S. Department of Agriculture, state and local governments cooperating. Oklahoma Cooperative Extension Service offers its programs to all eligible persons regardless of race, color, national origin, religion, sex, age or disability and is an Equal Opportunity Employer.

Soil, Water & Forage Analytical Laboratory

APPENDIX D

PROCEDURES FOR CONDUCTING HERBICIDE AND ADJUVANT PHYSICAL COMPATIBILITY TEST

Procedures for Conducting Herbicide and Adjuvant Physical Compatibility Test

1. Mix all herbicides together in the simulated spray tank (bottle) first, before attempting to add any adjuvant. The mixing order of products should follow the guidelines given below.

Mixing order for herbicides:

- a. Ammonium sulfate (AMS)
- b. dry herbicides
- c. liquid solubles
- d. liquid emulsifiables
- e. adjuvants

Mixing should occur by slowly inverting bottle 3 or 4 times (no shaking) after each product is added. This should be adequate to mix all liquids but dry herbicides may require repeating the inversion process several more times over a 1-3 minute period or until all dry herbicide prills are visibly dispersed. Inverting bottles should be performed to prevent excessive foaming if at all possible. All herbicides & AMS should be thoroughly mixed before attempting the addition of any adjuvants being tested.

2. Add the appropriate adjuvants to the herbicide mixture one at a time followed by slowly inverting the mixture 10 times. Evaluate the mixture immediately and move on to the next adjuvant, repeating the process. Once the first mixture is evaluated, make a note of the time on the score sheet. Once all evaluations are made with a particular herbicide treatment, allow the bottles to set undisturbed for 30 minutes (or as close as possible).

3. After 30 minutes evaluate each of the bottles for the 2nd time. It is acceptable to pick up the bottles, but this should be done carefully so as not to disturb the mixture. After evaluation, place each bottle down undisturbed. It might be helpful to hold the mixture with a bright light (light bulb, window) behind the bottle to backlight the mixture making possible incompatibilities more visible. When the last mixture is evaluated proceed immediately to the 3rd evaluation.

4. The 3rd and final evaluation occurs by slowly inverting the first bottle 10 times followed by evaluation.

5. Each herbicide treatment will have 3 evaluation sheets, one sheet for each evaluation timing. When evaluations are completed, staple the 3 evaluation sheets together.

APPENDIX E

PHYSICAL COMPATIBILITY TEST DATA COLLECTION FORM

Physical Compatibility Test Data Collection Form. 2011.

Herbicide Treatment & Number:											Date/Evaluator:						
			1. Were precipitates formed?					2. Were separate layers formed?			3. Did herbicide mixture flocculate?			4. Was there a change in			5. Other?
Adjuvant	Rep	Evaluation	No	flakes	colored	clear	sludge	No	suspend	settled	No	suspend	settled	No	more	less	
None	1	1															
None	1	2															
None	1	3															
Control	1	1															
Control	2	1															
Control	1	2															
Control	2	2															
Control	1	3															
Control	2	3															
Corral Poly	1	1															
Corral Poly	2	1															
Corral Poly	1	2															
Corral Poly	2	2															
Corral Poly	1	3															
Corral Poly	2	3															