

A SUGGESTED 2010 REVISION OF THE ODOT APPROVED HERBICIDE & ADJUVANT LIST (AHAL)

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Submitted to:

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Metric Conversion Page

SI (METRIC) CONVERSION FACTORS

<i>Approximate Conversions to SI Units</i>					<i>Approximate Conversions from SI Units</i>				
Symbol	When you know	Multiply by	To Find	Symbol	Symbol	When you know	Multiply by	To Find	Symbol
LENGTH					LENGTH				
in	inches	25.40	millimeters	mm	mm	millimeters	0.0394	inches	in
ft	feet	0.3048	meters	m	m	meters	3.281	feet	ft
yd	yards	0.9144	meters	m	m	meters	1.094	yards	yds
mi	miles	1.609	kilometers	km	km	kilometers	0.6214	miles	mi
AREA					AREA				
in ²	square inches	645.2	square millimeters	mm ²	mm ²	square millimeters	0.00155	square inches	in ²
ft ²	square feet	0.0929	square meters	m ²	m ²	square meters	10.764	square feet	ft ²
yd ²	square yards	0.8361	square meters	m ²	m ²	square meters	1.196	square yards	yd ²
ac	acres	0.4047	hectares	ha	ha	hectares	2.471	acres	ac
mi ²	square miles	2.590	square kilometers	km ²	km ²	square kilometers	0.3861	square miles	mi ²
VOLUME					VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL	mL	milliliters	0.0338	fluid ounces	fl oz
gal	gallon	3.785	liters	L	L	liters	0.2642	gallon	gal
ft ³	cubic feet	0.0283	cubic meters	m ³	m ³	cubic meters	35.315	cubic feet	ft ³
yd ³	cubic yards	0.7645	cubic meters	m ³	m ³	cubic meters	1.308	cubic yards	yd ³
MASS					MASS				
oz	ounces	28.35	grams	g	g	grams	0.0353	ounces	oz
lb	pounds	0.4536	kilograms	kg	kg	kilograms	2.205	pounds	lb
T	short tons (2000 lb)	0.907	megagrams	Mg	Mg	megagrams	1.1023	short tons (2000 lb)	T
TEMPERATURE (exact)					TEMPERATURE (exact)				
°F	degrees Fahrenheit	(°F-32)/1.8	degrees Celsius	°C	°C	degrees Fahrenheit	9/5(°C)+32	degrees Celsius	°F
FORCE and PRESSURE or STRESS					FORCE and PRESSURE or STRESS				
lbf	poundforce	4.448	Newtons	N	N	Newtons	0.2248	poundforce	lbf
lbf/in ²	poundforce per square inch	6.895	kilopascals	kPa	kPa	kilopascals	0.1450	poundforce per square inch	lbf/in ²

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1.0 INTRODUCTION

Only the products listed on the *Approved Herbicide and Adjuvant List (AHAL)* are approved for the ODOT Statewide Herbicide Contract. These herbicide/adjuvant items meet the minimum criteria set by ODOT. Any product not on the AHAL is not eligible for inclusion as a contract bid item in any upcoming bidding process. Herbicide/adjuvant products must meet minimum criteria before they will be placed on the current AHAL. Failure to meet one or more of the criteria will result in non-approval. The AHAL is updated annually and any listed products that fail to maintain minimum approval criteria will be removed along with any other products ODOT decides to remove. Manufacturers and distributors are encouraged to resubmit non-approved products at a later date once minimum approval criteria is met. ODOT reserves the right of final herbicide inclusion or exclusion to provide for specific herbicide product exemptions in the case of but not limited to: herbicide manufacturer supply issues, herbicide manufacturer delivery issues, EPA label issues, ODAFF label issues, and Oklahoma legislative issues.

2.0 MINIMUM CRITERIA FOR HERBICIDES

1. All herbicides must maintain current registrations with the Environmental Protection Agency (EPA) and Oklahoma Department of Agriculture, Food & Forestry (ODAFF). Current registration numbers must be included on the submission form. Different or changed herbicide formulations of the same active ingredient will require separate approval or re-approval. Efficacy and compatibility testing involving herbicide active ingredients that are on the current ODOT AHAL will not be initiated until both EPA and ODAFF registration numbers are provided on the submission form.
2. The final submission packet for all herbicides must include a hard-copy of the most current EPA and/or supplemental EPA labels and/or ODAFF supplemental labels (24-C or 2ee if applicable). All labels and/or supplemental labels must clearly state the identification of active ingredients, the concentration of both active and inert ingredients and recommended product use rates. Special attention will be paid to surfactant loading in applicable herbicide products. Herbicides that are formulated with surfactants where the surfactant percentage load is not stated on their labels must have this information submitted on the herbicides AHAL submission form.
3. The final submission packet for an herbicide active ingredient not on the current ODOT AHAL will require a sample product submission to the Oklahoma State University Roadside Vegetation Management (OSU RVM) Research Program to in order that weed control efficacy and tank mix compatibility testing can be conducted by the OSU RVM program. All testing and data analysis will occur prior to inclusion on the current ODOT AHAL. A minimum of 1 pint (liquid herbicide) or 1 pound (dry herbicide) must be submitted for testing purposes. Unused untested product will be disposed of as per label directions.

4. All herbicides require a minimum of efficacy and compatibility testing prior to inclusion in the ODOT AHAL. Efficacy testing involving an herbicide active ingredient or ingredients that are not on the current ODOT AHAL will involve a minimum of 2 growing seasons (2 years) of efficacy data on roadside weed control and bermudagrass herbicide tolerance. Efficacy testing involving herbicide active ingredients that are on the current ODOT AHAL will involve a minimum of 1 growing season (1 year) of efficacy data on roadside weed control and bermudagrass injury. Efficacy data must include a minimum of 15, 30, and 60 days-after-application evaluations on roadside weed control and bermudagrass injury as compared to current ODOT standard treatment(s). If all other pre-approval criteria are met, a product would likely be available for inclusion in the ODOT Statewide Herbicide Contract the year following the final year of efficacy and/or compatibility testing. Efficacy research involving herbicide active ingredient(s) that are not on the current ODOT AHAL must be provided by the OSU RVM Research Program. Contact OSU RVM Research Program personnel for current scheduling and supplemental pricing of research. Efficacy data involving herbicide active ingredients that are on the current ODOT AHAL can be provided by the OSU RVM Research Program or similar data will be accepted from another Land Grant University Research Program. Efficacy data from a Land Grant University, other than Oklahoma State University, must be accompanied with contact information (name, address, and phone number) of the researcher(s) (See Appendix A). All efficacy testing performed by the OSU RVM Research Program will also include tank mix compatibility testing via an industry standard jar test method. Efficacy data submitted from another Land Grant University Research Program that does not include compatibility data will require compatibility testing before inclusion on the ODOT AHAL. Efficacy and compatibility test data from manufacturers/distributors internal research will not be accepted.

3.0 MINIMUM CRITERIA FOR ADJUVANTS

1. All adjuvants (mainly drift control products), liquid or dry forms, require a minimum of compatibility testing with current standard ODOT broadcast herbicide treatments. A minimum of 1 pint (liquid adjuvant) or 1 pound (dry adjuvant) must be submitted for testing purposes. Unused untested product will be disposed of as per label directions. Different or changed adjuvant formulations of a specific name brand adjuvant will require separate approval or reapproval. Compared to herbicide formulations, it is much more difficult to monitor formulation changes in adjuvants. Therefore, manufacturers/distributors are encouraged to submit new or changed formulations for compatibility testing. Compatibility testing should be conducted using a standard jar test method (Appendix C.). Compatibility testing should include, but is not limited to, all herbicide treatments currently used by ODOT in major broadcast spray programs that require the use of drift control products (ODOT Policy Number D 504-1). Adjuvants should be tested using

current standard ODOT herbicide rates and carrier rates. Drift control product rates evaluated should be those recommended on the products label for application conditions as closely related to ODOT roadside programs as possible. Compatibility research can be supplied by the OSU RVM Research Program or similar data will be accepted from another Land Grant University Research Program. Contact OSU RVM Research Program personnel for current scheduling and pricing of research. Compatibility data from a Land Grant University other than Oklahoma State University must be accompanied with contact information (name, address, and phone number) of the researcher(s) (See Appendix B). Compatibility data from manufacturers/distributors internal research will not be accepted.

2. Certain types of adjuvants are exempt from the pre-approval process as far as compatibility testing. The following types of adjuvants are currently exempt: non-ionic surfactants, non-ionic surfactants (aquatic approved), sprayable grade ammonium sulfate, water soluble dyes, oil soluble dyes, and activated charcoal clean-up products. These types of adjuvants need only meet ODOT herbicide contract bid specifications to be considered for possible awards.

4.0 AHAL PRODUCT SUBMISSION REQUIREMENTS

A product's final submission packet must include the following:

- o completed submission form
- o current and legible EPA/Supplemental label(s), ODAFF supplemental label (24-C or 2ee if applicable), or hard-copy product label
- o complete efficacy research data packet (required for all herbicide products, See Appendix A)
- o complete compatibility research data packet (required for all drift control products and herbicides, See Appendix B)

Recommendations concerning approval or non-approval decisions will be made within 30 days of the date that a complete final submission packet is received by Oklahoma State University (OSU) Roadside Vegetation Management (RVM) Research personnel. The final decision on approval will be mailed by ODOT to the manufacturer and/or distributor contact person within 30 days of receipt of the OSU RVM Research Program recommendation of approval or non-approval.

For Research Inquiries Contact: Doug Montgomery
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Roadside Vegetation Management Program
358 Ag Hall
Stillwater, OK 74078
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doug.montgomery@okstate.edu

Figure 1. Approved Herbicide and Adjuvant List (AHAL) Submission Form

Date:
Product Trade Name:
Product Formulation:
Product Active Ingredient(s):
Product Active Ingredient(s) Concentration:
Product Inert Ingredient(s) Concentration:
Manufacturer:
Manufacturer Contact:
Name:
Address:
Phone Number:
E-mail:
EPA Registration Number:
ODAFF Registration Number:
EPA/ODAFF Supplemental label numbers (24-C/2ee):

Send Submission Form & Packet To: Doug Montgomery, Oklahoma State University, 358 Ag Hall, Stillwater, OK 74078.

5.0 DATA REQUIREMENTS FOR HERBICIDE RESEARCH DATA PACKET

1. Efficacy data is required for all herbicides being submitted for inclusion in the AHAL.
2. Efficacy data must be generated using labeled product information.
3. Efficacy data must be generated using common standard weed control research equipment, techniques, methods, experimental design and statistical analysis.
4. Efficacy data for an herbicide active ingredient not on the current ODOT AHAL will require a minimum of data from two growing seasons with three treatment replications per season.
5. Efficacy data for an herbicide active ingredient that is represented on the current ODOT AHAL (i.e. generic herbicides) will require a minimum of data from one growing season with three treatment replications.
6. Efficacy data on specific weed problems found along Oklahoma roadsides is preferred. This would include but is not limited to the following weed species:
 - A. Winter Annual/Biennial/Perennial Weeds
 - downy brome, cheat, annual ryegrass, hairy vetch, musk thistle, scotch thistle, sweet clover, wheat and/or other cereal grains
 - B. Summer Annual/Biennial/Perennial Weeds
 - johnsongrass, Illinois bundleflower, field bindweed, kochia, crabgrass spp., foxtail spp., pigweed spp., silver bluestem, common bermudagrass (total vegetation control)
7. Efficacy data on common bermudagrass phytotoxicity must also be submitted.
8. Efficacy data generated must be accompanied by clear, concise descriptions of how data was collected (i.e. visual, plant counts, etc.) and the scale used to collect data.
9. Efficacy data must include 15, 30, and 60 days-after-application evaluations.
10. Efficacy data should be subjected to analysis of variance and means should be separated using an appropriate separation test at the 90% confidence or certainty level, also known as $p=0.10$, also known as probability (p) of a greater F value = 0.10, also known as $p > F = 0.10$.
11. Efficacy data should be accompanied in a summary report describing materials and methods, data analysis, and discussion of results.
12. All efficacy testing should include comparison treatments using current ODOT standard treatments (see most current OSU publication E-958: Suggested herbicides for roadside weed control). OSU RVM program personnel may be contacted for recommendations on standard treatments.
13. Research should be conducted on roadside areas or areas which are being managed with no supplemental fertilization or irrigation.

6.0 DATA REQUIREMENTS FOR COMPATIBILITY RESEARCH DATA PACKET

1. Compatibility data is required for all herbicides and adjuvants (drift control products) being submitted for inclusion in the AHAL.
2. Compatibility data must be generated using labeled adjuvant information.
3. Compatibility data must be generated using common standard compatibility jar test method.
4. All adjuvants should be tested for compatibility with current ODOT broadcast herbicide treatments and rates.
5. Compatibility testing should include but is not limited to the following treatments (rates):
 - A. Landmaster BW + Ammonium Sulfate (2 pts./A + 17 lbs./100 gal. of water)
 - B. MSMA (2 qts/A)
 - C. Roundup Pro Concentrate (1 qt./A)
 - D. Ranger Pro (1 qt./A)
 - E. Roundup Pro Concentrate + Oust XP (1 pt. + 1.0 oz./A)
 - F. Roundup Pro Concentrate + Outrider (1 pt. + 1.0 oz./A)
 - G. Vanquish + NIS (1 qt./A)
 - H. Overdrive + NIS (4 oz./A)
 - I. Transline + NIS (8 oz./A)
6. Compatibility data generated must be accompanied by clear, concise descriptions of how data was collected (i.e. visual) and clear a description of all observations.
7. Compatibility data must include observations taken immediately after mixtures are made and shaken, 30 minutes after initial shaking (before re-shaking), and immediately after re-shaking.
8. Compatibility data should be accompanied in a summary report describing materials and methods and discussion of results.

7.0 PROCEDURES FOR COMPATIBILITY JAR TEST

1. Mix all herbicides together first before attempting to add any adjuvant.

Mixing order for herbicides (unless otherwise stated on label):

- a. AMS
- b. dry herbicides
- c. liquid solubles
- d. liquid emulsifiables

Mixing should occur by slowly inverting bottle 3 or 4 times after each product is added. This should be adequate to mix all liquids but dry herbicides will 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 done 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. Repeat for the rest of the mixtures.

5. Each testing procedure will have 3 evaluations. Incompatibilities could be in the form of excessive foaming, sludges, gels, particulates, globules, and formation of layers just to mention a few. Incompatibilities occur when these forms are created instantly or over time and will not easily disperse with final agitation.

Table 1. 2010/2011 ODOT Approved Herbicide & Adjuvant List (AHAL) [Revised October 2010]

Item Number	Product Type	Item-Description	Manufacturer/ Distributor	EPA Reg. Number	Oklahoma State Registration ID	EPA/ODAFF Supplemental label number	Date Approved M/Y
1	herbicide	MSMA 6.0 Plus 2.5 gallon container	Drexel	19713-42	12102	NA	8/04
1	herbicide	Target 6 Plus 2.5 gallon container	Luxemborg-Panol, LTD	42519-3	27201	NA	8/09
1	herbicide	Weed-Hoe 108 2.5 gallon container	Albaugh	42750-29	29574	NA	8/09
2	herbicide	Landmaster BW 2.5 gallon container	Albaugh	42750-62	31715	NA	8/09
3	herbicide	Landmaster BW 30 gallon container	Albaugh	42750-MO-1	31715	NA	8/09
4	liquid drift control	Detain II 1 quart container	Winfield Soutions	NA	NA	NA	8/04
4	liquid drift control	Pointblank WM 1 quart container	Helena	NA	NA	NA	8/04
5	herbicide	SFM 75 3 lb. container	Veg.Mgmt., LLC	72167-11-7447	33357	NA	9/07
5	herbicide	SFM E Pro 3 lb. container	Etigra	79676-16	38530	NA	8/04
5	herbicide	Oust XP 3 lb. container	Dupont	352-601	29681	NA	8/04
6	liquid non-ionic surfactant aquatic	AquaKing 1 gallon container	Winfield Soutions	NA	NA	NA	8/04
6	liquid non-ionic surfactant aquatic	Red River 90 1 gallon container	Red River Specialties	NA	NA	NA	8/04

6	liquid non-ionic surfactant aquatic	Timberland 90 1 gallon container	UAP	NA	NA	NA	8/04
6	liquid non-ionic surfactant aquatic	Induce 1 gallon container	Helena	NA	NA	NA	8/04
7	Dry ammonium sulfate	APF AMS 51 lb. bag	Winfield Soutions	NA	NA	NA	9/07
7	Dry ammonium sulfate	Royal AMS 51 lb. bay	Winfield Soutions	NA	NA	NA	8/04
8	herbicide	Outrider 20 oz. container	Monsanto	524-500	28030	NA	8/04
9	liquid non-ionic surfactant	SurfKing 1 gallon container	Winfield Soutions	NA	NA	NA	8/04
9	liquid non-ionic surfactant	Red River 90 1 gallon container	Red River Specialties	NA	NA	NA	8/04
9	liquid non-ionic surfactant	Timberland 90 1 gallon container	UAP	NA	NA	NA	8/04
9	liquid non-ionic surfactant	AD-Spray 80 1 gallon container	Helena	NA	NA	NA	8/04
10	herbicide	Vanquish 2.5 gallon container	Syngenta/Nufarm	100-84	27130	NA	8/04
11	dry ammonium sulfate w/drift	Array 51 lb. bag	Winfield Soutions	NA	NA	NA	8/04

	control						
11	dry ammonium sulfate w/drift control	Dry Poly Wet 51 lb. bag	Red River Specialties	NA	NA	NA	8/04
11	dry ammonium sulfate w/drift control	StrikeZone PPS 51 lb. bag	Helena	NA	NA	NA	8/04
12	herbicide	Honcho Plus 2.5 gallon container	Monsanto	524-454	32548	NA	8/04
12	herbicide	Mirage 2.5 gallon container	UAP-Loveland Products	524-445-34704	36246	NA	8/04
12	herbicide	Mirage Plus 2.5 gallon container	UAP-Loveland Products	524-454-34704	36110	NA	8/04
12	herbicide	Ranger Pro 2.5 gallon container	Monsanto	524-517	34884	NA	10/08
13	herbicide	Roundup Pro Concentrate 2.5 gallon container	Monsanto	524-529	30902	NA	8/04
14	herbicide	Honcho Plus 30 gallon container	Monsanto	524-454	32548	NA	8/04
14	herbicide	Mirage 30 gallon container	UAP-Loveland Products	524-445-34704	36246	NA	8/04
14	herbicide	Mirage Plus 30 gallon container	UAP-Loveland Products	524-454-34704	36110	NA	8/04
14	herbicide	Ranger Pro 30 gallon container	Monsanto	524-517	34884	NA	10/08
15	herbicide	Roundup Pro Concentrate 120 gallon container	Monsanto	524-529	30902	NA	8/04
16	herbicide	Roundup Pro Concentrate 30 gallon container	Monsanto	524-529	30902	NA	8/04

17	herbicide	Transline 2.5 gallon container	Dow AgroSciences	62719-259	26637	NA	8/04
18	herbicide	Overdrive 7.5 lb. container	BASF	7969-150	34320	yes/2ee	2/06
19	herbicide	Milestone VM 1 quart container	Dow AgroSciences	62719-537	38891	NA	12/06
20	herbicide	Arsenal 2.5 gallon container	BASF	241-346-241	19479	NA	8/04
20	herbicide	Imazapyr 2 SL 2.5 gallon container	Veg. Mgmt., LLC	74477-4	39581	NA	12/06
21	herbicide	Plateau 1 gallon container	BASF	241-365-241	23522	NA	8/04
22	herbicide	Garlon 3A 2.5 gallon container	Dow AgroSciences	62719-37	26564	NA	8/04
23	herbicide	AquaMaster 2.5 gallon container	Monsanto	524-343	29960	NA	8/04
23	herbicide	AquaStar 2.5 gallon container	Albaugh	42750-59	34324	NA	8/04
24	herbicide	Banvel 2.5 gallon container	Arysta, LLC	66330-276	40358	NA	10/10
25	herbicide	Transline 1.0 gallon container	Dow AgroSciences	62719-259	26637	NA	8/04
26	herbicide	Garlon 4 2.5 gallon container	Dow AgroSciences	62719-40	26567	NA	8/04
27	herbicide	Garlon 4 Ultra 2.5 gallon container	Dow AgroSciences	62719-517	40078	NA	9/07

28	herbicide	Escort XP	Dupont	352-439	31631	NA	8/04
28	herbicide	Metsulfuron methyl	Veg. Mgmt., LLC	74477-2	32604	NA	8/04
28	herbicide	MSM E-Pro	Etigra	81959-14	39746	NA	9/07
29	herbicide	Sahara DG	BASF	241-372-241	23960	NA	8/04
30	herbicide	Tordon K 1 gallon container	Dow AgroSciences	62719-17	26552	NA	8/04
31	herbicide	Krenite S 2.5 gallon container	Dupont	352-395	2265	NA	8/04
32	herbicide	Pathfinder II 2.5 gallon container	Dow AgroSciences	62719-176	26618	NA	8/04
33	herbicide	Vista 2.5 gallon container	Dow AgroSciences	62719-308	27888	NA	8/04
34	herbicide	Oust Extra	Dupont	352-622	34305	NA	8/04
35	herbicide	Diuron 80 WDG	Loveland Industries	34704-648	35346	NA	9/07
36	herbicide	Habitat 1 quart container	BASF	241-246	35480	NA	10/07
37	herbicide	Pastora	Dupont	352-819	?	N/A	10/10