Noncrop and Invasive Vegetation Management Weed Science

2009 Annual Research Report

UNIVERSITY
OF KENTUCKY

College of Agriculture
Department of Plant and Soil Sciences

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INFORMATION NOTE 2009 NCVM-1

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The information provided in this document represents a collaborative effort between the Roadside Environment Branch of the Kentucky Transportation Cabinet and the Department of Plant and Soil Sciences in the College of Agriculture at the University of Kentucky. The main priority of this project was to collect and disseminate information to the KTC REB to increase the efficiency of operations aimed at roadside environment management.

This report contains a summary of research conducted during 2008 and 2009. This document is primarily for the use of the Kentucky Transportation Cabinet. Other use is allowable if proper credit is given to the authors. Weather data was obtained from weather recorders located on site of the Princeton Agricultural Research Station in Princeton, KY (located in western Kentucky), the Spindletop Agricultural Research Station in Lexington, KY (located in central Kentucky), and a University of Kentucky operated weather station located in Jackson, KY (located in eastern Kentucky)

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Acknowledgements

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Mitch Blair, the Research Scientist managing the project, moved to another position during the season. Fortunately, Daisy Fryman stepped up and completed the trials and data collection for 2009. Other personnel in the Weed Science group who also aided in this project in terms of labor, equipment, and ideas include Charlie Slack, Sara Carter, Ted Hicks, Jack Zeleznik, Dr. J.D. Green, and Dr. Jim Martin. Appreciation is also given to the farm crews at Spindletop Research Station for equipment and plot maintenance.

The research could not have been accomplished if not for the generous contributions of product. Contributors of product used include:

BASF Corporation
Dow AgroSciences
DuPont
Townsend Chemical
Valent U.S.A. Corp.

External funding for research projects was received from BASF Corporation, Dow AgroSciences LLC, DuPont Inc., and Valent U.S.A. Corp. The financial support of these organizations is greatly appreciated.

We sincerely appreciate the effort and continued support of all our cooperators and look forward to future endeavors.

Species List

The following is a list of plant species discussed in the following document.

Scientific Name	Common Name
Carduus nutans L.	Musk thistle
Conium maculatum L.	Poison Hemlock
Conyza canadensis (L.) Cronq.	Marestail
Dactylis glomerata L.	Orchardgrass
Dipsacus fullonum L.	Common teasel
Festuca arundinaceum (Schreb.) S.J. Darbyshire	Tall Fescue
Lespedeza cuneata (Dumont) G. Don	Sericea lespedeza
Poa pratensis L.	Kentucky Bluegrass
Ulmus alata Michx.	Winged Elm

Herbicide List

The following is a list of herbicides discussed in the following document.

Product	Active Ingredient(s)	Concentration	Manufacturer
Arsenal	imazapyr	2 lb ae per gallon	BASF
Arsenal Powerline	imazapyr	2 lb ae per gallon	BASF
Clearcast	imazamox	1 lb ae per gallon	BASF
Escort XP	metsulfuron methyl	60 % w/w	DuPont
Garlon 4	triclopyr ester	4 lb ae per gallon	Dow AgroSciences
Glyphomax Plus	glyphosate	3 lb ae per gallon	Dow AgroSciences
Hyvar X	bromacil	80% w/w	DuPont
Journey	imazapic + glyphosate	0.75 lb ae + 1.5 lb ae per gallon	BASF
KJM44	aminocyclopyrachlor	80% w/w	DuPont
MAT28	aminocyclopyrachlor	50% w/w	DuPont
Milestone VM	aminopyralid	2 lb ae per gallon	Dow AgroSciences
Milestone VM Plus	aminopyralid + triclopyr	0.1 lb ae + 1.0 lb ae per gallon	Dow AgroSciences
Overdrive	diflufenzopyr + dicamba	0.2 lb ae + 0.5 lb ae per pound	BASF
Payload	flumioxazin	51% w/w	Valent
Plateau	imazapic	2 lb ae per gallon	BASF
Remedy	triclopyr ester	4 lb ae per gallon	Dow AgroSciences
Roundup WeatherMAX	glyphosate	4.5 lb ae per gallon	Monsanto
Streamline	aminocyclopyrachlor + metsulfuron methyl	39.5% + 12.6% w/w	DuPont
Stronghold	mefluidide + imazethapyr + imazapyr	1.46 lb ae + 0.35 lb ae + 0.01 lb ae per gallon	PBI/Gordon
Telar XP	chlorsulfuron	75% w/w	DuPont
V10206	V10206	85% w/w	Valent
V10233	flumioxazin + pyroxasulfone	33.5% + 42.5% w/w	Valent
Viewpoint	imazapyr + aminocyclopyrachlor + metsulfuron	31.6% + 22.8% + 7.3% w/w	DuPont

2009 Field Season Weather Data
Eastern Kentucky (Jackson Weather Station)

This weather data provided by the University of Kentucky
Agricultural Weather Center (Phone (859)257-3000 Ext245)
World Wide Web URL: http://wwwagwx.ca.uky.edu/

		AIR TEMP				RH		SOIL TEMP GRASS	SOIL TEMP BARE	
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX MN	MX MN	EVAP
Jackson	03-01-2009	36	27	32	0.13	96	26	44 42		
Jackson	03-02-2009	27	13	20		68	7	38 31		
Jackson	03-03-2009	32	9	20		70	27	38 35		
Jackson	03-04-2009	50	22	36		50	17	41 40		
Jackson	03-05-2009	66	38	52		44	25	38 36		
Jackson	03-06-2009	67	54	60		69	35	47 42		
Jackson	03-07-2009	78	56	67		74	34	47 43		
Jackson	03-08-2009	72	59	66	T	86	49	48 44		
Jackson	03-09-2009	68	46	57	0.18	83	31	40 38		
Jackson	03-10-2009	77	55	66		50	40	52 46		
Jackson	03-11-2009	52	40	46	0.14	93	44	55 54		
Jackson	03-12-2009	38	30	34	0.08	88	25	43 42		
Jackson	03-13-2009	39	29	34	0.55	93	26	43 42		
Jackson	03-14-2009	42	34	38	0.49	96	36	41 40		
Jackson	03-15-2009	54	42	48	0.28	100	87	49 44		
Jackson	03-16-2009	54	49	52	0.30	100	87	49 48		
Jackson	03-17-2009	66	39	52		100	31	49 48		
Jackson	03-18-2009	72	46	59		68	32	54 53		
Jackson	03-19-2009	56	45	50	0.06	89	28	44 43		
Jackson	03-20-2009	50	32	41		52	29	54 53		
Jackson	03-21-2009	60	32	46		56	19	54 53		
Jackson	03-22-2009	66	38	52		43	23	53 48		
Jackson	03-23-2009	66	38	52		41	23	54 53		
Jackson	03-24-2009	75	49	62		39	25	56 53		
Jackson	03-25-2009	62	53	58	0.08	94	38	56 55		
Jackson	03-26-2009	57	50	54	0.69	100	79	46 45		
Jackson	03-27-2009	56	44	50	0.21	96	77	46 45		
Jackson	03-28-2009	68	50	59	0.22	97	58	56 52		
Jackson	03-29-2009	44	38	41	0.20	93	62	55 51		
Jackson	03-30-2009	60	34	47	T	82	28	56 49		
Jackson	03-31-2009	65	41	53	T	64	27	54 50		

Summary for Jackson for the period 3-1-2009 through 3-31-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS	SOIL TEMP BARE	TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX MN	MX MN	EVAP
Jackson	57	40	48	3.61	77	38	48 46		
(Deviation from normal)	+3	+6	+5	-0.73					

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Agricultural Weather Center (Phone (859)257-3000 Ext245)
World Wide Web URL: http://wwwagwx.ca.uky.edu/

		AIR TEMP				RH		SOIL TEMP GRASS		SOIL TEMP BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Jackson	04-01-2009	67	49	58	0.20	93	22	56	55			
Jackson	04-02-2009	79	48	64		56	36	58	57			
Jackson	04-03-2009	54	45	50	0.53	94	57	57	54			
Jackson	04-04-2009	64	38	51		85	22	58	53			
Jackson	04-05-2009	80	44	62		88	20	58	53			
Jackson	04-06-2009	45	35	40	0.52	93	31	59	52			
Jackson	04-07-2009	40	29	34	0.20	88	27	47	46			
Jackson	04-08-2009	58	32	45		73	29	50	49			
Jackson	04-09-2009	68	37	52	0.02	86	18	54	46			
Jackson	04-10-2009	70	53	62	0.34	94	31	54	49			
Jackson	04-11-2009	61	44	52	0.37	100	32	47	46			
Jackson	04-12-2009	61	35	48		59	20	56	49			
Jackson	04-13-2009	65	46	56	0.01	68	27	55	54			
Jackson	04-14-2009	56	48	52	0.35	94	68	47	36			
Jackson	04-15-2009	45	42	44	0.04	93	81	56	55			
Jackson	04-16-2009	64	43	54		93	40	55	51			
Jackson	04-17-2009	75	49	62		54	21	56	51			
Jackson	04-18-2009	77	44	60		56	19	58	54			
Jackson	04-19-2009	56	53	54	0.45	97	32	58	56			
Jackson	04-20-2009	55	49	52	0.25	93	68	60	57			
Jackson	04-21-2009	58	44	51	0.03	83	68	58	54			
Jackson	04-22-2009	63	39	51	T	76	22	56	52			
Jackson	04-23-2009	74	46	60		54	23	60	54			
Jackson	04-24-2009	90	62	76	T	52	18	62	57			
Jackson	04-25-2009	89	68	78		42	22	64	60			
Jackson	04-26-2009	89	66	78		54	22	64	59			
Jackson	04-27-2009	88	65	76		45	17	56	55			
Jackson	04-28-2009	82	63	72		75	35	68	63			
Jackson	04-29-2009	76	59	68	0.32	94	51	66	65			
Jackson	04-30-2009	75	63	69	0.01	83	53	67	63			

Summary for Jackson for the period 4-1-2009 through 4-30-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		SOIL TEMP BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Jackson	67	48	58	3.64	77	34	57	54			
(Deviation from normal)	+2	+3	+3	-0.46							

This weather data provided by the University of Kentucky
Agricultural Weather Center (Phone (859)257-3000 Ext245)
World Wide Web URL: http://wwwagwx.ca.uky.edu/

STATION	DATE	AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Jackson	05-01-2009	75	60	68	0.35	94	61	65	63			
Jackson	05-02-2009	57	53	55	0.23	100	83	65	62			
Jackson	05-03-2009	56	53	54	0.39	100	89	64	61			
Jackson	05-04-2009	61	50	56	2.43	97	77	66	62			
Jackson	05-05-2009	62	53	58	0.20	96	82	55	55			
Jackson	05-06-2009	67	53	60	0.29	100	82	62	61			
Jackson	05-07-2009	73	58	66	0.23	100	63	63	62			
Jackson	05-08-2009	78	58	68	1.39	100	57	66	62			
Jackson	05-09-2009	74	65	70	1.46	97	48	66	64			
Jackson	05-10-2009	69	50	60		83	39	55	55			
Jackson	05-11-2009	67	50	58	0.03	93	49	63	62			
Jackson	05-12-2009	71	46	58		82	29	61	60			
Jackson	05-13-2009	72	54	63	0.20	83	44	68	64			
Jackson	05-14-2009	78	63	70	0.06	94	56	62	61			
Jackson	05-15-2009	81	62	72	0.36	93	55	69	66			
Jackson	05-16-2009	81	64	72	0.53	100	61	70	66			
Jackson	05-17-2009	62	47	54	0.26	87	36	68	67			
Jackson	05-18-2009	64	42	53		65	26	68	63			
Jackson	05-19-2009	73	46	60		54	23	66	62			
Jackson	05-20-2009	80	49	64		58	27	66	63			
Jackson	05-21-2009	82	58	70		55	31	71	64			
Jackson	05-22-2009	84	63	74		72	42	72	66			
Jackson	05-23-2009	84	64	74		73	45	73	67			
Jackson	05-24-2009	81	67	74		78	52	72	68			
Jackson	05-25-2009	75	67	71	0.20	100	65	72	70			
Jackson	05-26-2009	81	64	72	T	93	55	73	70			
Jackson	05-27-2009	75	65	70	0.25	97	78	73	69			
Jackson	05-28-2009	82	65	74	0.01	97	58	72	70			
Jackson	05-29-2009	72	59	66	0.22	96	54	72	69			
Jackson	05-30-2009	77	53	65		93	61	74	69			
Jackson	05-31-2009	77	64	70		87	37	74	69			

Summary for Jackson for the period 5-1-2009 through 5-31-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Jackson	73	57	65	9.09	88	54	67	64			
(Deviation from normal)	-2	+2	-0	+4.61							

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			AIR TEMP				RH		SOIL TEMP GRASS		SOIL TEMP BARE		
STATION	DATE		MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Jackson	06-01-2009		83	56	70		80	37	75	68			
Jackson	06-02-2009		86	62	74	0.47	94	52	79	70			
Jackson	06-03-2009		75	61	68	0.74	100	73	75	73			
Jackson	06-04-2009		62	57	60	0.81	100	90	73	71			
Jackson	06-05-2009		72	55	64	0.01	97	51	71	68			
Jackson	06-06-2009		77	52	64		89	37	70	68			
Jackson	06-07-2009		83	57	70		86	47	72	68			
Jackson	06-08-2009		83	65	74		84	60	73	69			
Jackson	06-09-2009		84	66	75		90	50	73	69			
Jackson	06-10-2009		78	66	72	0.15	100	66	71	63			
Jackson	06-11-2009		76	65	70	0.67	100	76	73	71			
Jackson	06-12-2009		74	65	70		93	73	74	72			
Jackson	06-13-2009		79	62	70		100	57	72	69			
Jackson	06-14-2009		81	63	72	T	97	55	73	72			
Jackson	06-15-2009	E	81	65	73	0.03	100	62	74	72			
Jackson	06-16-2009	E	82	65	74	1.36	100	67	74	71			
Jackson	06-17-2009		85	64	74	0.60	97	65	74	72			
Jackson	06-18-2009		77	64	70	0.25	97	81	75	73			
Jackson	06-19-2009		89	68	78		93	57	76	73			
Jackson	06-20-2009		88	74	81		84	54	77	74			
Jackson	06-21-2009		85	68	76		93	52	75	73			
Jackson	06-22-2009		83	70	76		81	58	79	75			
Jackson	06-23-2009		85	65	75		87	42	81	76			
Jackson	06-24-2009		85	63	74		84	47	76	73			
Jackson	06-25-2009		87	65	76	1.47	96	53	79	75			
Jackson	06-26-2009		86	65	76	0.55	100	60	81	79			
Jackson	06-27-2009		85	69	77		100	54	81	79			
Jackson	06-28-2009		85	66	76		94	52	81	80			
Jackson	06-29-2009		81	60	70		83	45	81	77			
Jackson	06-30-2009		77	62	70		81	51	80	76			

Summary for Jackson for the period 6-1-2009 through 6-30-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		SOIL TEMP BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Jackson	81	64	72	7.11	93	57	76	72			
(Deviation from normal)	-2	+1	-0	+3.29							

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		AIR TEMP				RH		SOIL TEMP GRASS		SOIL TEMP BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Jackson	07-01-2009	75	60	68		90	59	79	77			
Jackson	07-02-2009	67	61	64	0.05	94	67	78	75			
Jackson	07-03-2009	76	56	66		93	55	76	74			
Jackson	07-04-2009	75	60	68	0.01	93	66	76	73			
Jackson	07-05-2009	69	64	66	0.88	100	93	75	73			
Jackson	07-06-2009	81	62	72	0.01	97	76	76	74			
Jackson	07-07-2009	82	62	72		81	45	77	73			
Jackson	07-08-2009	81	62	72		83	46	80	74			
Jackson	07-09-2009	82	64	73		81	50	80	77			
Jackson	07-10-2009	83	63	73		94	59	80	76			
Jackson	07-11-2009	83	69	76	0.36	90	62	80	76			
Jackson	07-12-2009	83	68	76	0.17	91	62	79	77			
Jackson	07-13-2009	80	65	72		81	43	80	75			
Jackson	07-14-2009	81	59	70		83	43	80	76			
Jackson	07-15-2009	78	67	72	0.04	90	67	80	74			
Jackson	07-16-2009	83	69	76		94	71	77	76			
Jackson	07-17-2009	80	67	74	0.29	97	58	78	74			
Jackson	07-18-2009	69	55	62		90	60	76	73			
Jackson	07-19-2009	70	54	62		93	54	75	72			
Jackson	07-20-2009	76	53	64		96	57	77	71			
Jackson	07-21-2009	80	57	68		90	48	76	72			
Jackson	07-22-2009	77	67	72	0.11	90	66	75	72			
Jackson	07-23-2009	77	65	71	0.09	100	61	76	73			
Jackson	07-24-2009	81	62	72		93	53	76	74			
Jackson	07-25-2009	86	65	76	0.06	90	54	76	75			
Jackson	07-26-2009	79	66	72	1.54	100	73	77	76			
Jackson	07-27-2009	82	65	74		100	52	78	76			
Jackson	07-28-2009	82	65	74		93	64	79	75			
Jackson	07-29-2009	77	67	72	1.07	100	68	77	76			
Jackson	07-30-2009	83	67	75	0.78	97	69	79	78			
Jackson	07-31-2009	80	67	74	0.95	100	64	78	77			

Summary for Jackson for the period 7-1-2009 through 7-31-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		SOIL TEMP BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Jackson	79	63	71	6.41	92	60	78	75			
(Deviation from normal)	-7	-2	-4	+1.16							

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World Wide Web URL: http://wwwagwx.ca.uky.edu/

STATION	DATE	AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Jackson	08-01-2009	81	62	72		100	64	78	77			
Jackson	08-02-2009	80	68	74	0.77	96	54	79	77			
Jackson	08-03-2009	79	60	70		93	55	78	73			
Jackson	08-04-2009	70	64	67	1.83	100	75	78	73			
Jackson	08-05-2009	73	63	68	0.19	100	84	78	74			
Jackson	08-06-2009	80	62	71		100	64	78	77			
Jackson	08-07-2009	80	61	70		81	48	78	75			
Jackson	08-08-2009	85	65	75	T	90	58	82	76			
Jackson	08-09-2009	89	71	80		85	58	82	80			
Jackson	08-10-2009	88	72	80	0.07	91	62	82	78			
Jackson	08-11-2009	85	68	76	0.05	96	65	82	78			
Jackson	08-12-2009	82	66	74	0.04	94	64	80	78			
Jackson	08-13-2009	81	63	72		100	59	80	77			
Jackson	08-14-2009	85	64	74		94	49	80	77			
Jackson	08-15-2009	88	68	78		94	49	79	77			
Jackson	08-16-2009	88	69	78		84	44	80	79			
Jackson	08-17-2009	84	70	77	0.06	87	58	82	77			
Jackson	08-18-2009	81	70	76	0.11	94	71	81	78			
Jackson	08-19-2009	81	71	76	0.09	96	74	81	78			
Jackson	08-20-2009	84	70	77	T	90	62	79	78			
Jackson	08-21-2009	83	70	76	0.07	90	59	79	79			
Jackson	08-22-2009	77	63	70		93	51	79	75			
Jackson	08-23-2009	72	59	66		94	65	77	76			
Jackson	08-24-2009	78	58	68		90	57	77	73			
Jackson	08-25-2009	85	61	73		90	49	76	73			
Jackson	08-26-2009	86	66	76		96	49	78	74			
Jackson	08-27-2009	87	66	76		97	46	79	76			
Jackson	08-28-2009	77	68	72	0.01	93	68	79	75			
Jackson	08-29-2009	78	66	72	0.26	100	62	78	76			
Jackson	08-30-2009	74	59	66		92	51	78	75			
Jackson	08-31-2009	74	52	63		90	51	77	72			

Summary for Jackson for the period 8-1-2009 through 8-31-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Jackson	81	65	73	3.55	93	59	79	76			
(Deviation from normal)	-3	+3	-0	-0.46							

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		AIR TEMP				RH		SOIL TEMP GRASS		SOIL TEMP BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Jackson	09-01-2009	77	56	66		84	57	77	73			
Jackson	09-02-2009	79	59	69		92	48	76	72			
Jackson	09-03-2009	80	59	70		89	38	75	72			
Jackson	09-04-2009	81	59	70	T	86	45	75	73			
Jackson	09-05-2009	82	63	72		75	47	74	72			
Jackson	09-06-2009	69	63	66	0.32	97	65	75	74			
Jackson	09-07-2009	73	64	68	0.50	100	81	73	72			
Jackson	09-08-2009	79	58	68	0.01	100	61	72	71			
Jackson	09-09-2009	80	58	69	0.53	100	52	75	73			
Jackson	09-10-2009	78	60	69	T	97	57	68	67			
Jackson	09-11-2009	78	59	68	0.01	96	64	67	66			
Jackson	09-12-2009	78	58	68	0.01	94	58	67	66			
Jackson	09-13-2009	76	57	66		87	48	76	73			
Jackson	09-14-2009	80	59	70		93	40	67	66			
Jackson	09-15-2009	79	61	70		90	48	67	66			
Jackson	09-16-2009	79	65	72		87	53	67	66			
Jackson	09-17-2009	79	60	70		86	64	67	65			
Jackson	09-18-2009	77	66	72	0.07	97	64	66	65			
Jackson	09-19-2009	75	62	68		94	73	67	66			
Jackson	09-20-2009	78	66	72	0.33	94	68	67	66			
Jackson	09-21-2009	76	67	72	0.02	90	76	67	66			
Jackson	09-22-2009	83	65	74	0.01	93	62	67	66			
Jackson	09-23-2009	82	67	74	0.12	93	62	73	72			
Jackson	09-24-2009	82	68	75	0.08	100	69	75	72			
Jackson	09-25-2009	75	67	71	0.36	100	83	75	73			
Jackson	09-26-2009	69	62	66	2.48	97	93	74	72			
Jackson	09-27-2009	71	58	64	0.04	96	56	73	71			
Jackson	09-28-2009	69	58	64	T	84	38	73	71			
Jackson	09-29-2009	60	47	54		83	60	71	67			
Jackson	09-30-2009	58	50	54		89	64	68	66			

Summary for Jackson for the period 9-1-2009 through 9-30-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		SOIL TEMP BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Jackson	76	61	68	4.89	92	60	71	69			
(Deviation from normal)	-2	+5	+2	+1.37							

2009 Field Season Weather Data
Central Kentucky (Spindletop Weather Station)

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		AIR TEMP				RH		SOIL TEMP GRASS		SOIL TEMP BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Spindletop	03-01-2009	40	23	32	0.03	90	31	39	37	40	38	
Spindletop	03-02-2009	28	13	20		73	34	37	35	38	36	
Spindletop	03-03-2009	35	10	22		85	29	35	34	36	35	
Spindletop	03-04-2009	54	21	38		71	20	37	34	37	35	
Spindletop	03-05-2009	66	35	50		61	39	41	35	42	36	
Spindletop	03-06-2009	64	55	60		81	42	45	41	46	42	
Spindletop	03-07-2009	73	55	64		88	50	49	44	50	45	
Spindletop	03-08-2009	70	58	64	0.16	92	59	51	48	52	49	
Spindletop	03-09-2009	64	39	52		91	48	51	47	52	48	
Spindletop	03-10-2009	76	46	61		80	45	52	48	53	49	
Spindletop	03-11-2009	69	34	52	0.16	97	39	52	48	53	48	
Spindletop	03-12-2009	35	27	31		98	59	47	43	48	44	
Spindletop	03-13-2009	49	30	40	0.01	97	49	45	42	46	43	
Spindletop	03-14-2009	44	37	40	0.32	99	65	44	43	45	44	
Spindletop	03-15-2009	53	43	48		100	87	46	44	48	45	
Spindletop	03-16-2009	61	47	54	0.02	99	64	49	46	51	47	
Spindletop	03-17-2009	69	40	54		100	37	52	45	53	47	
Spindletop	03-18-2009	71	47	59		76	35	52	47	54	49	
Spindletop	03-19-2009	57	41	49	0.19	97	20	52	50	54	51	
Spindletop	03-20-2009	49	28	38		77	41	50	45	51	47	
Spindletop	03-21-2009	59	28	44		78	26	50	44	51	46	
Spindletop	03-22-2009	65	32	48		79	26	51	45	52	46	
Spindletop	03-23-2009	67	45	56		57	31	51	48	53	49	
Spindletop	03-24-2009	72	42	57		59	31	52	48	54	49	
Spindletop	03-25-2009	63	57	60	0.44	98	59	53	51	54	53	
Spindletop	03-26-2009	58	42	50	0.48	99	73	54	52	55	54	
Spindletop	03-27-2009	58	43	50	0.18	98	77	52	50	54	51	
Spindletop	03-28-2009	65	44	54	0.18	100	75	53	50	55	52	
Spindletop	03-29-2009	48	38	43	0.01	88	71	53	48	55	49	
Spindletop	03-30-2009	58	32	45		96	41	52	46	54	47	
Spindletop	03-31-2009	65	40	52	0.01	77	40	50	48	52	50	

Summary for Spindletop for the period 3-1-2009 through 3-31-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		SOIL TEMP BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Spindletop	58	38	48	2.19	86	47	48	45	50	46	
(Deviation from normal)	+4	+4	+4	-2.21							

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		AIR TEMP				RH		SOIL TEMP GRASS		BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Spindletop	04-01-2009	62	42	52	0.22	94	29	54	49	56	51	
Spindletop	04-02-2009	75	41	58	0.24	94	46	54	49	57	51	
Spindletop	04-03-2009	57	41	49	0.59	97	67	54	51	56	53	
Spindletop	04-04-2009	61	35	48		96	32	54	48	56	49	
Spindletop	04-05-2009	75	42	58	0.36	93	40	55	50	58	52	
Spindletop	04-06-2009	54	34	44	0.13	96	80	55	50	57	51	
Spindletop	04-07-2009	42	32	37	0.03	99	45	50	48	51	48	
Spindletop	04-08-2009	55	33	44		74	36	50	46	52	47	
Spindletop	04-09-2009	63	34	48		87	31	52	46	55	48	
Spindletop	04-10-2009	62	50	56	1.07	99	66	52	50	54	53	
Spindletop	04-11-2009	58	40	49	0.09	98	34	54	51	57	52	
Spindletop	04-12-2009	58	33	46		76	32	53	49	55	51	
Spindletop	04-13-2009	68	47	58	0.29	97	40	52	50	55	52	
Spindletop	04-14-2009	58	44	51	0.17	99	72	54	52	56	54	
Spindletop	04-15-2009	47	43	45		97	83	53	51	54	53	
Spindletop	04-16-2009	61	44	52		99	57	53	50	56	52	
Spindletop	04-17-2009	71	37	54		84	33	56	49	59	52	
Spindletop	04-18-2009	74	43	58		89	31	58	52	61	54	
Spindletop	04-19-2009	62	53	58	0.79	98	47	57	55	60	57	
Spindletop	04-20-2009	57	43	50	0.25	98	62	55	54	57	56	
Spindletop	04-21-2009	51	39	45	0.06	93	53	53	51	56	54	
Spindletop	04-22-2009	62	38	50		84	27	53	49	56	51	
Spindletop	04-23-2009	70	42	56		76	38	55	50	59	53	
Spindletop	04-24-2009	82	60	71		73	31	59	54	63	57	
Spindletop	04-25-2009	83	63	73		64	31	61	57	65	59	
Spindletop	04-26-2009	84	62	73		69	34	63	58	67	60	
Spindletop	04-27-2009	82	63	72		65	30	64	60	67	62	
Spindletop	04-28-2009	72	63	68	0.03	96	43	62	61	65	63	
Spindletop	04-29-2009	78	61	70	0.04	99	53	64	61	68	63	
Spindletop	04-30-2009	72	63	68	0.12	93	68	63	62	66	64	

Summary for Spindletop for the period 4-1-2009 through 4-30-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Spindletop	65	46	55	4.48	89	46	56	52	58	54	
(Deviation from normal)	-0	+1	+0	+0.60							

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STATION	DATE		AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Spindletop	05-01-2009		73	56	64	0.25	97	68	64	62	67	64	
Spindletop	05-02-2009		59	51	55	0.21	98	73	63	61	66	63	
Spindletop	05-03-2009		59	52	56	0.38	98	80	61	59	63	62	
Spindletop	05-04-2009		64	52	58	0.17	99	71	60	58	64	61	
Spindletop	05-05-2009		71	55	63		93	56	62	59	66	62	
Spindletop	05-06-2009		64	56	60	0.64	98	90	61	60	65	63	
Spindletop	05-07-2009		73	58	66	0.01	98	67	64	61	65	63	
Spindletop	05-08-2009		75	57	66	0.94	98	71	65	61	66	63	
Spindletop	05-09-2009		72	54	63		98	48	65	63	66	65	
Spindletop	05-10-2009		70	47	58	0.06	96	43	66	60	66	62	
Spindletop	05-11-2009		69	52	60		93	47	65	62	65	63	
Spindletop	05-12-2009		69	42	56		92	37	65	59	65	61	
Spindletop	05-13-2009		73	51	62	0.20	93	60	63	60	64	62	
Spindletop	05-14-2009		73	59	66	0.21	98	70	65	61	66	63	
Spindletop	05-15-2009		81	53	67	0.03	100	53	67	61	67	63	
Spindletop	05-16-2009		77	58	68	0.01	91	62	68	64	68	65	
Spindletop	05-17-2009		61	47	54		72	34	65	62	66	63	
Spindletop	05-18-2009		65	40	52		75	29	64	58	63	60	
Spindletop	05-19-2009		73	39	56		86	29	65	57	63	59	
Spindletop	05-20-2009		78	47	62		84	29	67	59	64	60	
Spindletop	05-21-2009		83	54	68		83	35	70	62	67	62	
Spindletop	05-22-2009		84	61	72		85	38	73	65	69	64	
Spindletop	05-23-2009		86	60	73		97	39	74	67	70	66	
Spindletop	05-24-2009		80	64	72	T	81	56	72	68	74	73	
Spindletop	05-25-2009	E	78	66	72	0.73	87	68	73	69	74	70	
Spindletop	05-26-2009	E	81	66	74	0.09	90	58	73	70	74	70	
Spindletop	05-27-2009		81	65	73	0.25	98	60	74	70	72	70	
Spindletop	05-28-2009		81	65	73	0.09	98	61	73	70	73	70	
Spindletop	05-29-2009		75	60	68		96	52	74	69	73	70	
Spindletop	05-30-2009		79	58	68	0.50	95	57	72	68	71	68	
Spindletop	05-31-2009		78	59	68	0.28	93	43	75	68	73	69	

Summary for Spindletop for the period 5-1-2009 through 5-31-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Spindletop	74	55	64	5.05	92	54	67	63	68	64	
(Deviation from normal)	-2	+0	-1	+0.58							

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STATION	DATE	AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Spindletop	06-01-2009	85	56	70		88	47	74	68	73	68	
Spindletop	06-02-2009	89	67	78	0.26	92	45	77	71	76	71	
Spindletop	06-03-2009	77	60	68	0.17	96	69	74	71	74	71	
Spindletop	06-04-2009	59	55	57	0.43	98	95	72	66	73	67	
Spindletop	06-05-2009	76	51	64		96	40	71	64	72	66	
Spindletop	06-06-2009	78	48	63		96	32	73	65	73	66	
Spindletop	06-07-2009	84	58	71		90	40	74	67	74	68	
Spindletop	06-08-2009	84	64	74		92	49	75	70	75	71	
Spindletop	06-09-2009	87	70	78		85	41	77	71	77	72	
Spindletop	06-10-2009	78	66	72	0.70	98	72	74	72	75	72	
Spindletop	06-11-2009	79	66	72	0.57	99	74	73	70	74	71	
Spindletop	06-12-2009	73	64	68	0.06	99	79	73	70	74	71	
Spindletop	06-13-2009	83	58	70		100	48	76	69	76	70	
Spindletop	06-14-2009	84	62	73	0.31	99	48	76	71	76	72	
Spindletop	06-15-2009	82	65	74	0.33	99	61	77	72	77	73	
Spindletop	06-16-2009	82	67	74	0.11	98	68	76	73	76	73	
Spindletop	06-17-2009	89	66	78		95	56	78	72	78	73	
Spindletop	06-18-2009	83	70	76	0.17	97	63	76	74	77	75	
Spindletop	06-19-2009	93	72	82		94	50	80	74	81	75	
Spindletop	06-20-2009	89	69	79	0.30	98	53	80	75	81	76	
Spindletop	06-21-2009	87	68	78		95	57	80	75	80	76	
Spindletop	06-22-2009	85	72	78	0.19	95	65	80	77	81	77	
Spindletop	06-23-2009	86	66	76		98	41	82	75	82	76	
Spindletop	06-24-2009	88	64	76		97	46	82	75	82	76	
Spindletop	06-25-2009	91	68	80	1.29	98	52	82	76	82	77	
Spindletop	06-26-2009	88	67	78	0.52	98	60	81	74	81	75	
Spindletop	06-27-2009 E	90	69	80		90	40	81	74	81	75	
Spindletop	06-28-2009	85	68	76		94	43	81	77	81	78	
Spindletop	06-29-2009	83	62	72		74	38	79	74	79	75	
Spindletop	06-30-2009	77	65	71		81	52	78	73	78	74	

Summary for Spindletop for the period 6-1-2009 through 6-30-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Spindletop	83	64	74	5.41	94	54	77	72	77	73	
(Deviation from normal)	+0	+2	+1	+1.75							

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		AIR TEMP				RH		SOIL TEMP GRASS		BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Spindletop	07-01-2009	72	62	67		95	62	75	73	76	73	
Spindletop	07-02-2009	70	60	65		91	58	73	71	73	72	
Spindletop	07-03-2009	80	60	70		92	56	75	70	76	71	
Spindletop	07-04-2009	75	60	68	0.28	98	66	73	70	74	71	
Spindletop	07-05-2009	72	64	68	0.44	99	85	71	70	73	71	
Spindletop	07-06-2009	82	59	70		100	45	75	69	77	70	
Spindletop	07-07-2009	83	59	71		97	45	77	70	78	71	
Spindletop	07-08-2009	81	62	72		91	44	76	71	78	72	
Spindletop	07-09-2009	86	65	76		85	44	78	72	80	73	
Spindletop	07-10-2009	86	67	76	0.12	94	62	78	73	78	75	
Spindletop	07-11-2009	83	72	78		93	69	78	74	78	75	
Spindletop	07-12-2009	84	70	77		98	52	78	74	79	75	
Spindletop	07-13-2009	82	63	72		94	42	78	73	80	74	
Spindletop	07-14-2009	84	60	72		95	38	78	72	80	73	
Spindletop	07-15-2009	80	67	74	0.09	94	64	76	73	77	75	
Spindletop	07-16-2009	84	72	78		96	60	77	74	79	75	
Spindletop	07-17-2009	77	61	69	0.36	97	51	76	73	77	75	
Spindletop	07-18-2009	70	57	64		93	57	73	70	74	71	
Spindletop	07-19-2009	75	54	64		99	51	72	67	73	69	
Spindletop	07-20-2009	79	54	66		99	43	73	67	75	69	
Spindletop	07-21-2009	81	55	68		98	45	74	67	76	69	
Spindletop	07-22-2009	70	65	68	0.83	98	79	72	70	74	72	
Spindletop	07-23-2009	78	64	71		97	61	72	69	75	71	
Spindletop	07-24-2009	82	61	72		98	47	74	69	75	71	
Spindletop	07-25-2009	83	66	74	0.83	97	64	73	71	75	73	
Spindletop	07-26-2009	82	67	74	0.28	99	48	75	71	76	73	
Spindletop	07-27-2009	84	61	72		97	46	75	70	77	72	
Spindletop	07-28-2009	82	65	74	0.16	95	71	74	71	75	73	
Spindletop	07-29-2009	81	70	76	0.20	97	66	75	72	76	74	
Spindletop	07-30-2009	82	68	75	0.20	98	71	75	72	77	74	
Spindletop	07-31-2009	82	66	74	2.10	99	54	75	71	77	73	

Summary for Spindletop for the period 7-1-2009 through 7-31-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Spindletop	80	63	71	5.89	96	56	75	71	76	72	
(Deviation from normal)	-6	-2	-4	+0.89							

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STATION	DATE	AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Spindletop	08-01-2009	82	63	72	0.07	99	55	75	71	76	73	
Spindletop	08-02-2009	78	62	70	0.40	97	53	74	72	76	74	
Spindletop	08-03-2009	81	58	70		99	53	74	69	76	72	
Spindletop	08-04-2009	73	64	68	2.10	100	79	72	70	74	72	
Spindletop	08-05-2009	80	65	72	0.05	99	67	73	69	75	72	
Spindletop	08-06-2009	83	64	74		99	49	74	71	76	73	
Spindletop	08-07-2009	81	57	69		97	43	73	70	75	72	
Spindletop	08-08-2009	88	65	76		93	55	74	71	76	73	
Spindletop	08-09-2009	90	73	82		86	56	76	73	78	75	
Spindletop	08-10-2009	89	70	80		97	60	77	74	78	76	
Spindletop	08-11-2009	86	68	77	0.20	98	61	76	74	78	76	
Spindletop	08-12-2009	84	65	74	0.10	99	54	76	74	78	76	
Spindletop	08-13-2009	85	62	74		99	43	76	73	78	75	
Spindletop	08-14-2009	86	60	73		98	40	76	72	77	74	
Spindletop	08-15-2009	88	64	76		96	54	76	72	78	74	
Spindletop	08-16-2009	89	70	80		95	46	76	73	78	76	
Spindletop	08-17-2009	88	70	79	0.24	95	51	76	74	77	76	
Spindletop	08-18-2009	83	70	76	0.40	96	70	75	74	77	76	
Spindletop	08-19-2009	87	71	79		98	62	77	74	78	76	
Spindletop	08-20-2009	84	70	77	0.30	96	68	76	74	77	76	
Spindletop	08-21-2009	81	67	74	1.00	99	48	75	73	77	75	
Spindletop	08-22-2009	72	59	66		98	71	74	71	76	74	
Spindletop	08-23-2009	74	59	66		95	59	72	70	74	73	
Spindletop	08-24-2009	78	54	66		99	54	72	69	74	71	
Spindletop	08-25-2009	86	57	72		99	55	74	69	75	71	
Spindletop	08-26-2009	88	64	76		99	50	75	71	76	73	
Spindletop	08-27-2009 E	89	67	78	0.28	97	46	79	76			
Spindletop	08-28-2009	80	69	74	0.17	96	71	74	73	75	74	
Spindletop	08-29-2009	78	62	70	0.07	98	58	74	73	76	74	
Spindletop	08-30-2009	75	56	66		98	41	73	70	75	72	
Spindletop	08-31-2009	73	51	62		95	51	71	69	72	70	

Summary for Spindletop for the period 8-1-2009 through 8-31-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Spindletop	83	64	73	5.38	97	56	75	72	76	74	
(Deviation from normal)	-1	+1	-0	+1.45							

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STATION	DATE	AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Spindletop	09-01-2009	75	51	63		91	47	70	67	71	69	
Spindletop	09-02-2009	81	57	69		95	54	71	68	72	69	
Spindletop	09-03-2009	80	60	70		96	39	72	69	73	71	
Spindletop	09-04-2009	81	59	70		93	43	72	69	74	71	
Spindletop	09-05-2009	83	57	70		95	37	72	68	75	70	
Spindletop	09-06-2009	82	60	71		98	60	72	69	74	71	
Spindletop	09-07-2009	79	63	71	0.47	98	62	73	70	75	72	
Spindletop	09-08-2009	80	63	72	0.60	99	67	73	70	76	72	
Spindletop	09-09-2009	82	59	70	0.01	100	50	74	70	76	72	
Spindletop	09-10-2009	78	62	70		100	63	73	70	76	73	
Spindletop	09-11-2009	81	60	70		99	56	74	70	76	72	
Spindletop	09-12-2009	77	55	66		95	48	73	69	75	72	
Spindletop	09-13-2009	78	55	66		98	51	72	69	75	71	
Spindletop	09-14-2009	81	55	68		99	40	72	68	75	70	
Spindletop	09-15-2009	80	56	68		99	56	71	68	74	71	
Spindletop	09-16-2009	81	61	71		99	56	72	69	75	71	
Spindletop	09-17-2009	77	55	66		91	64	71	68	74	71	
Spindletop	09-18-2009	80	64	72		89	69	72	70	74	72	
Spindletop	09-19-2009	78	60	69		87	58	71	69	74	72	
Spindletop	09-20-2009	75	63	69	0.90	99	83	70	69	73	71	
Spindletop	09-21-2009	76	68	72	0.66	98	81	71	70	73	72	
Spindletop	09-22-2009	81	67	74	0.19	97	71	73	70	75	72	
Spindletop	09-23-2009	79	69	74	0.06	98	76	73	71	75	74	
Spindletop	09-24-2009	79	67	73	1.10	99	80	73	72	76	74	
Spindletop	09-25-2009	74	66	70	0.38	99	89	72	71	75	74	
Spindletop	09-26-2009	73	61	67	1.00	100	79	72	71	74	73	
Spindletop	09-27-2009	69	59	64		99	66	71	69	73	71	
Spindletop	09-28-2009	70	53	62		85	40	69	66	71	68	
Spindletop	09-29-2009	57	48	52		86	65	66	64	67	65	
Spindletop	09-30-2009	60	46	53		98	62	64	63	66	65	

Summary for Spindletop for the period 9-1-2009 through 9-30-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Spindletop	77	59	68	5.37	96	60	71	69	74	71	
(Deviation from normal)	-1	+4	+1	+2.17							

2009 Field Season Weather Data
Western Kentucky (Princeton Weather Station)

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STATION	DATE		AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Princeton	03-01-2009		48	23	36		95	60	35	28			
Princeton	03-02-2009		39	19	29		95	40	33	27			
Princeton	03-03-2009		38	16	27		95	30	31	25			
Princeton	03-04-2009		58	27	42		95	20	35	26			
Princeton	03-05-2009		66	47	56		95	40	40	30			
Princeton	03-06-2009		73	61	67		95	65	45	39			
Princeton	03-07-2009		73	60	66		85	60	46	38			
Princeton	03-08-2009		74	51	62	0.39	90	70	46	39			
Princeton	03-09-2009		68	39	54		90	40	50	45			
Princeton	03-10-2009		76	59	68		80	60	52	45			
Princeton	03-11-2009		75	34	54	0.40	85	55	55	47			
Princeton	03-12-2009	E	75	34	54	0.40	85	55	55	47			
Princeton	03-13-2009	E	37	31	34	0.05	81	59	48	44			
Princeton	03-14-2009	E	49	32	40	0.03	94	69	47	43			
Princeton	03-15-2009	E	51	40	46	0.16	98	83	49	44			
Princeton	03-16-2009		65	49	57		95	60	50	43			
Princeton	03-17-2009		72	38	55		60	40	52	45			
Princeton	03-18-2009	E	72	38	55		60	40	52	45			
Princeton	03-19-2009		75	43	59	T	95	30	53	47			
Princeton	03-20-2009	E	59	43	51		95	30	53	47			
Princeton	03-21-2009	E	58	32	45		87	31	53	51			
Princeton	03-22-2009	E	59	33	46		85	30	53	48			
Princeton	03-23-2009	E	71	44	58		56	35	54	49			
Princeton	03-24-2009	E	78	65	72	0.17	78	38	55	50			
Princeton	03-25-2009	E	78	65	72	0.88	95	53	55	50			
Princeton	03-26-2009		67	47	57	T	95	40	55	47			
Princeton	03-27-2009	E	67	47	57	T	95	40	55	47			
Princeton	03-28-2009	E	60	49	54	0.17	100	87	56	52			
Princeton	03-29-2009	E	68	47	58	0.13	98	87	55	51			
Princeton	03-30-2009	E	62	29	46		97	36	58	50			
Princeton	03-31-2009	E	66	51	58	0.11	78	41	54	50			

Summary for Princeton for the period 3-1-2009 through 3-31-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Princeton	64	42	53	2.89	88	49	49	43			
(Deviation from normal)	+3	+6	+5	-2.05							

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STATION	DATE		AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Princeton	04-01-2009	E	65	37	51		90	26	52	44			
Princeton	04-02-2009		71	38	54		95	50	52	44			

Princeton	04-03-2009	E	70	43	56	2.35	98	62	54	49
Princeton	04-04-2009	E	72	32	52		94	35	54	45
Princeton	04-05-2009	E	66	34	50	0.14	86	37	55	46
Princeton	04-06-2009	E	56	35	46	0.11	97	62	54	44
Princeton	04-07-2009	E	51	34	42		97	34	53	44
Princeton	04-08-2009	E	66	30	48		78	34	51	42
Princeton	04-09-2009	E	66	33	50	T	90	35	50	40
Princeton	04-10-2009	E	64	50	57	0.39	100	42	48	40
Princeton	04-11-2009	E	61	41	51		98	41	54	48
Princeton	04-12-2009	E	64	42	53		95	41	55	48
Princeton	04-13-2009	E	69	42	56	0.20	84	48	50	41
Princeton	04-14-2009	E	66	45	56	T	98	78	52	44
Princeton	04-15-2009	E	56	44	50		98	74	52	46
Princeton	04-16-2009	E	66	40	53		97	63	53	46
Princeton	04-17-2009		76	44	60		96	35	54	46
Princeton	04-18-2009	E	75	44	60		95	60	54	47
Princeton	04-19-2009	E	71	46	58	1.18	90	65	53	45
Princeton	04-20-2009		66	51	58	0.04	95	40	53	45
Princeton	04-21-2009		66	46	56		95	40	54	46
Princeton	04-22-2009		70	42	56		90	40	55	46
Princeton	04-23-2009		78	43	60		95	50	57	48
Princeton	04-24-2009		84	63	74		75	50	59	52
Princeton	04-25-2009		85	50	68		90	40	59	52
Princeton	04-26-2009		85	64	74		90	40	61	53
Princeton	04-27-2009	E	85	65	75		95	50	61	53
Princeton	04-28-2009	E	81	64	72	0.45	95	50	68	63
Princeton	04-29-2009	E	79	61	70	0.10	96	65	67	64
Princeton	04-30-2009	E	78	62	70	0.39	95	60	67	63

Summary for Princeton for the period 4-1-2009 through 4-30-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		SOIL TEMP BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Princeton	70	46	58	5.35	93	48	55	48			
(Deviation from normal)	-1	-1	-1	+0.55							

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		AIR TEMP				RH		SOIL TEMP GRASS		BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Princeton	05-01-2009	71	61	66	0.89	100	70	63	57			
Princeton	05-02-2009	67	50	58	0.50	100	100	64	55			
Princeton	05-03-2009	60	53	56	0.46	90	70	65	57			
Princeton	05-04-2009	65	54	60	0.10	90	70	65	57			
Princeton	05-05-2009	73	55	64		90	55	60	55			
Princeton	05-06-2009	73	59	66	0.35	100	85	62	57			
Princeton	05-07-2009	80	62	71	0.40	100	55	64	59			
Princeton	05-08-2009	81	50	66	0.99	100	75	66	62			
Princeton	05-09-2009	74	64	69	0.21	95	50	67	64			
Princeton	05-10-2009	73	52	62		80	40	67	63			
Princeton	05-11-2009	71	51	61	0.14	100	50	65	60			
Princeton	05-12-2009	76	51	64		90	40	66	62			
Princeton	05-13-2009	77	50	64		95	80	66	59			
Princeton	05-14-2009	78	61	70	0.79	95	70	66	60			
Princeton	05-15-2009	85	61	73		90	70	69	60			
Princeton	05-16-2009	79	67	73	T	100	80	69	65			
Princeton	05-17-2009	71	50	60		70	40	70	64			
Princeton	05-18-2009	69	43	56		90	30	63	55			
Princeton	05-19-2009	77	40	58		95	30	64	56			
Princeton	05-20-2009	80	45	62		90	30	65	56			
Princeton	05-21-2009	85	47	66		100	46	69	60			
Princeton	05-22-2009	84	57	70		90	50	69	61			
Princeton	05-23-2009	85	49	67		90	70	69	62			
Princeton	05-24-2009	82	50	66	0.91	90	50	70	62			
Princeton	05-25-2009	80	68	74	0.05	100	70	70	63			
Princeton	05-26-2009	82	65	74	0.35	90	60	71	65			
Princeton	05-27-2009	86	65	76		100	70	70	65			
Princeton	05-28-2009	86	59	72		100	65	70	65			
Princeton	05-29-2009	86	56	71	T	100	65	71	67			
Princeton	05-30-2009	85	57	71		90	50	70	62			
Princeton	05-31-2009	87	65	76		90	40	69	61			

Summary for Princeton for the period 5-1-2009 through 5-31-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Princeton	78	55	67	6.14	94	59	67	61			
(Deviation from normal)	-3	-1	-2	+1.18							

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		AIR TEMP				RH		SOIL TEMP GRASS		SOIL TEMP BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Princeton	06-01-2009	90	60	75		100	50	70	62			
Princeton	06-02-2009	89	65	77		95	39	79	70			
Princeton	06-03-2009	90	67	78	0.85	100	100	72	68			
Princeton	06-04-2009	67	58	62	0.32	100	100	72	68			
Princeton	06-05-2009	74	51	62		100	40	65	60			
Princeton	06-06-2009	80	51	66		100	40	68	62			
Princeton	06-07-2009	86	60	73		100	40	69	66			
Princeton	06-08-2009	83	69	76	T	95	70	69	65			
Princeton	06-09-2009	86	64	75	0.11	95	60	70	67			
Princeton	06-10-2009	85	70	78		80	68	71	63			
Princeton	06-11-2009	86	68	77	0.19	95	70	70	65			
Princeton	06-12-2009	86	65	76	1.70	95	65	73	67			
Princeton	06-13-2009	85	62	74	0.01	100	80	71	70			
Princeton	06-14-2009	83	68	76		80	70	72	70			
Princeton	06-15-2009	83	70	76	0.26	100	90	73	68			
Princeton	06-16-2009	79	65	72	0.59	100	80	73	68			
Princeton	06-17-2009	91	66	78		100	79	74	68			
Princeton	06-18-2009	92	67	80	3.91	100	69	75	71			
Princeton	06-19-2009	91	75	83		100	68	76	71			
Princeton	06-20-2009	93	77	85		100	69	79	73			
Princeton	06-21-2009	92	73	82		100	40	65	60			
Princeton	06-22-2009	95	77	86		100	60	80	70			
Princeton	06-23-2009	96	72	84	0.03	100	70	81	76			
Princeton	06-24-2009	90	69	80		100	40	65	60			
Princeton	06-25-2009	93	69	81		100	60	80	72			
Princeton	06-26-2009	93	74	84		96	68	81	79			
Princeton	06-27-2009	94	73	84		90	40	81	80			
Princeton	06-28-2009	89	74	82		96	45	81	80			
Princeton	06-29-2009	89	57	73		97	40	81	77			
Princeton	06-30-2009	90	63	76		100	50	79	73			

Summary for Princeton for the period 6-1-2009 through 6-30-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		SOIL TEMP BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Princeton	87	67	77	7.97	97	62	74	69			
(Deviation from normal)	+0	+3	+2	+4.12							

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STATION	DATE	AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Princeton	07-01-2009	81	60	70		96	55	79	77			
Princeton	07-02-2009	80	63	72		97	62	78	75			
Princeton	07-03-2009	84	58	71		95	50	76	74			
Princeton	07-04-2009	80	67	74	2.14	97	56	76	73			
Princeton	07-05-2009	77	70	74		97	95	75	73			
Princeton	07-06-2009	83	65	74		95	48	76	74			
Princeton	07-07-2009	87	61	74		100	40	76	70			
Princeton	07-08-2009	89	65	77		100	40	79	72			
Princeton	07-09-2009	89	63	76		95	46	80	77			
Princeton	07-10-2009	92	68	80		100	60	78	72			
Princeton	07-11-2009	92	68	80		100	60	78	72			
Princeton	07-12-2009	85	70	78	0.95	94	56	79	77			
Princeton	07-13-2009	84	65	74	0.08	100	60	75	72			
Princeton	07-14-2009	87	62	74		100	50	76	71			
Princeton	07-15-2009	85	71	78		100	60	77	70			
Princeton	07-16-2009	87	68	78	0.60	100	80	75	73			
Princeton	07-17-2009	84	67	76		100	45	75	71			
Princeton	07-18-2009	70	59	64		97	58	76	73			
Princeton	07-19-2009	74	53	64		95	52	75	72			
Princeton	07-20-2009	80	54	67		97	49	77	71			
Princeton	07-21-2009	82	58	70		100	55	74	67			
Princeton	07-22-2009	77	63	70	1.76	100	80	71	69			
Princeton	07-23-2009	82	61	72		96	56	76	73			
Princeton	07-24-2009	85	67	76		96	64	76	74			
Princeton	07-25-2009	85	73	79		96	63	76	75			
Princeton	07-26-2009	84	69	76		96	52	77	76			
Princeton	07-27-2009	86	64	75		95	46	78	76			
Princeton	07-28-2009	85	65	75	1.16	100	95	78	72			
Princeton	07-29-2009	81	68	74	0.76	100	72	74	73			
Princeton	07-30-2009	80	71	76		96	80	79	78			
Princeton	07-31-2009	82	68	75		96	54	78	77			

Summary for Princeton for the period 7-1-2009 through 7-31-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Princeton	83	65	74	7.45	98	59	77	73			
(Deviation from normal)	-6	-2	-4	+3.16							

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STATION	DATE	AIR TEMP MX	MN	AV	PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	EVAP
Princeton	08-01-2009	82	64	73		96	57	78	77			
Princeton	08-02-2009	80	63	72		96	50	79	77			
Princeton	08-03-2009	87	63	75		85	6	76	68			
Princeton	08-04-2009	87	63	75		85	6	76	68			
Princeton	08-05-2009	92	65	78	1.50	100	60	77	68			
Princeton	08-06-2009	84	64	74		96	59	78	77			
Princeton	08-07-2009	87	65	76		100	65	76	68			
Princeton	08-08-2009	88	69	78		97	60	82	76			
Princeton	08-09-2009	89	72	80		96	60	82	80			
Princeton	08-10-2009	90	75	82		97	67	82	78			
Princeton	08-11-2009	81	69	75		96	74	82	78			
Princeton	08-12-2009	83	67	75		95	55	76	73			
Princeton	08-13-2009	87	60	74		100	50	76	71			
Princeton	08-14-2009	90	66	78		100	60	79	74			
Princeton	08-15-2009	89	66	78		100	50	79	74			
Princeton	08-16-2009	89	72	80		100	50	80	79			
Princeton	08-17-2009	91	65	78		100	60	78	73			
Princeton	08-18-2009	90	68	79		100	60	79	72			
Princeton	08-19-2009	90	68	79	0.65	100	50	79	75			
Princeton	08-20-2009	85	65	75	0.23	100	60	76	74			
Princeton	08-21-2009	82	65	74	0.03	96	49	79	79			
Princeton	08-22-2009	73	59	66		97	66	79	75			
Princeton	08-23-2009	74	54	64		97	59	77	76			
Princeton	08-24-2009	78	57	68		100	55	72	67			
Princeton	08-25-2009	87	56	72		100	50	72	67			
Princeton	08-26-2009	90	63	76		100	45	75	71			
Princeton	08-27-2009	91	64	78		100	45	76	72			
Princeton	08-28-2009	85	64	74		96	62	79	75			
Princeton	08-29-2009	81	69	75		92	48	78	76			
Princeton	08-30-2009	74	59	66		92	42	78	75			
Princeton	08-31-2009	74	53	64		100	50	75	67			

Summary for Princeton for the period 8-1-2009 through 8-31-2009:

STATION	AIR TEMP MX	MN	AV	TOTAL PRECIP	RH MX	MN	SOIL TEMP GRASS MX	MN	BARE MX	MN	TOTAL EVAP
Princeton	85	64	75	2.41	97	53	78	74			
(Deviation from normal)	-3	+0	-1	-1.60							

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		AIR TEMP				RH		SOIL TEMP GRASS		SOIL TEMP BARE		
STATION	DATE	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Princeton	09-01-2009	76	52	64		96	48	77	73			
Princeton	09-02-2009	80	56	68		95	60	74	65			
Princeton	09-03-2009	80	62	71	0.55	95	65	70	65			
Princeton	09-04-2009	83	61	72		100	55	70	68			
Princeton	09-05-2009	85	64	74		100	55	70	68			
Princeton	09-06-2009	80	66	73	0.19	94	52	75	74			
Princeton	09-07-2009	83	61	72		94	62	75	74			
Princeton	09-08-2009	83	66	74		100	55	72	67			
Princeton	09-09-2009	84	61	72		100	55	72	70			
Princeton	09-10-2009	85	62	74		100	55	75	70			
Princeton	09-11-2009	83	61	72		92	56	76	71			
Princeton	09-12-2009	83	65	74		92	56	76	71			
Princeton	09-13-2009	81	58	70		94	48	76	73			
Princeton	09-14-2009	84	60	72		100	60	72	65			
Princeton	09-15-2009	80	70	75	0.45	94	58	74	72			
Princeton	09-16-2009	83	68	76		93	60	74	72			
Princeton	09-17-2009	83	63	73		100	80	72	70			
Princeton	09-18-2009	82	64	73		94	78	73	72			
Princeton	09-19-2009	79	67	73	0.25	94	72	73	71			
Princeton	09-20-2009	79	71	75	0.09	94	84	73	72			
Princeton	09-21-2009	85	68	76		100	60	71	66			
Princeton	09-22-2009	84	68	76	0.01	90	70	72	71			
Princeton	09-23-2009	80	70	75		90	70	72	71			
Princeton	09-24-2009	81	71	76	1.23	100	70	71	68			
Princeton	09-25-2009	75	69	72	1.23	100	90	72	70			
Princeton	09-26-2009	77	63	70	0.61	94	84	74	72			
Princeton	09-27-2009	78	53	66		94	59	73	71			
Princeton	09-28-2009	79	59	69		100	40	70	65			
Princeton	09-29-2009	71	48	60		100	55	66	61			
Princeton	09-30-2009	68	44	56		96	57	68	66			

Summary for Princeton for the period 9-1-2009 through 9-30-2009:

	AIR TEMP			TOTAL	RH		SOIL TEMP GRASS		SOIL TEMP BARE		TOTAL
STATION	MX	MN	AV	PRECIP	MX	MN	MX	MN	MX	MN	EVAP
Princeton	80	62	71	4.61	96	62	73	69			
(Deviation from normal)	-1	+4	+2	+1.28							

V10206 Evaluation for Marestail (*Conyza canadensis*) and Total Vegetation Control

Introduction

Noncrop vegetation management occasionally requires total vegetation management and problematic plant species, such as marestail (*Conyza canadensis*), thrive in the environment created by total vegetation management. The potential for glyphosate and ALS resistant marestail plants to exist in these areas is increasing due to the repeated use of glyphosate and ALS inhibiting herbicides in total vegetation management. Control of marestail is a challenge as it has an extended period when it can germinate and grow. Successful control programs need a combination of foliar and long-term pre-emergence residual herbicides. New products (V10206 and V10233) from Valent were evaluated for total vegetation and marestail control.

Materials and Methods

Thirteen treatments were installed in late spring 2009 in a randomized complete block design with 4 replications beside guardrails in McLean County, near Livermore, KY. All treatments included Glyphomax Plus @ 2 qt/A and Activator 90 @ 0.25% v/v. Plots, measuring 5 ft x 8 ft, were treated at 40 GPA on May 18, 2009 using a CO_2 powered sprayer. The predominant vegetation was a dense stand of marestail. The height ranged from 4 to 12 inches with an average of 10 inches. The number of marestail plants were counted at 0, 25 (6/12/2009), 171 (11/5/2009) days after treatment (DAT). Evaluation of % bareground was done 25 DAT. Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results

The initial density of marestail plants ranged from means of 37 to 69 plants per 40 ft^2 plot (Table 1). All treatments were effective at killing the emerged plants with few survivors (0.3 to 0.5 plants per plot) 25 DAT. The survivors were in plots treated with the lower rates of Payload (flumioxazin), V10206, and V10233 (flumioxazin + pyroxasulfone). The lower rates for Payload were lower than the recommended label rates of 8 to 12 oz/acre. Payload is most effective pre-emergence on marestail. All treatments except the control, which only had glyphosate applied without any soil residual activity, were effective at suppressing further marestail germination/emergence. All treatments with soil residual activity provided better control of other species than the control, when looking at the % bareground data 25 DAT.

V10233 has been labeled as Fierce for the corn/soybean market. Some of the surviving plants may be resistant to glyphosate and using different herbicide modes of action (MOA) is important for resistance management. Flumioxazin has a PPG Oxidase Inhibition MOA and should be considered for inclusion in total vegetation control programs.

Table 1. Treatments and Results for Marestail and Total Vegetation Control Trial

Trt. No.	Product Name	Rate per Acre	Initial No. Marestail Plants per Plot		No. Marestail Plants per Plot	% Bareground		No. Marestail Plants per Plot	
					25 DAT	25 DAT		171 DAT	
1	Payload	12 OZ	45.8	*bc*	0.0	100.0	*a*	0.0	*b*
2	Payload	8 OZ	36.8	*c*	0.0	99.0	*ab*	0.0	*b*
3	Payload	6 OZ	60.8	*ab*	0.3	99.0	*ab*	0.3	*b*
4	Payload	4 OZ	54.8	*abc*	0.5	97.8	*b*	0.5	*b*
5	V10206	5.8 OZ	55.3	*abc*	0.3	99.5	*ab*	0.0	*b*
6	V10206	4.8 OZ	42.8	*bc*	0.0	99.3	*ab*	0.0	*b*
7	V10206	3.5 OZ	63.0	*ab*	0.5	98.5	*ab*	0.5	*b*
8	V10233	7 OZ	49.3	*abc*	0.5	99.0	*ab*	0.5	*b*
9	V10233	10 OZ	60.0	*ab*	0.0	99.5	*ab*	0.0	*b*
10	V10233	12 OZ	48.5	*abc*	0.0	100.0	*a*	0.0	*b*
11	Milestone VM Journey	7 FL OZ 32 FL OZ	68.8	*a*	0.0	100.0	*a*	0.0	*b*
12	Hyvar X	6 LB	46.0	*bc*	0.0	100.0	*a*	0.0	*b*
13	Control		57.3	*abc*	0.3	90.0	*c*	2.5	*a*
				ns	*ns*	*		*	

All treatments included Glyphomax Plus @ 2 qt/A and Activator 90 @ 0.25% v/v.
** Means within column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.*
ns Means within column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Brush Control with Aminocyclopyrachlor (MAT28)

Introduction

Utility and other non-crop vegetation managers rely on herbicides as an effective tool to control undesirable woody vegetation. One of the challenges is to control a wide range of species while minimizing damage to desirable vegetation, such as grass cover. Aminocyclopyrachlor (DPX-MAT28) is a synthetic auxin active ingredient developed by DuPont for the noncrop and invasive plant market. New products labeled in 2010 include Streamline with aminocyclopyrachlor and metsulfuron methyl while Viewpoint contains these active ingredients plus imazapyr. Different rates of these products were evaluated and compared with existing products for brush control (Table 1).

Materials and Methods

The trial was established on the Princeton research station in Caldwell County in an "old" field that had mixed brush and trees. The dominant species was Winged Elm (*Ulmus alata*) which ranged in height from 4 to 6 ft with an average of 5 ft. The 11 treatments were arranged in a randomized complete block design with three reps and 10 ft x 60 ft plots. Treatments 1 to 9 included methylated seed oil (MSO) at 1% v/v while treatment 10 included Activator 90 at 1% v/v (Table 1). Treatment 1 was lower than the label rates of 13 to 20 oz/acre for Viewpoint. The 4.76 oz/acre rate for Streamline (Trt. 5) is selective on most desirable grass species while Trt. 6 is close to the maximum label rate of 11.5 oz/acre. The high volume foliar herbicide treatments were applied with a compressed CO_2 powered hand gun at 100 gallons per acre on August 25, 2009. Visual percent control was assessed 21 (9/15/2009) and 338 (7/29/2010) days after treatment (DAT). Data were analyzed using ARM software and treatment means were compared using Fisher's Protected LSD at $p = 0.05$.

Results

All herbicide treatments except those only containing MAT28 had 87 to 90% control 21 DAT (Table 1). However, 338 DAT only the Streamline and Viewpoint treatments still had 90 to 93% control while the other treatments had lower control ratings (30 to 40%). The MAT28 alone as well as the triclopyr + imazapyr and aminopyralid + imazapyr combinations showed reduced control 338 DAT.

Table 1. Treatments and Results for Brush Control Trial

Trt. No.	Product Name	Rate	Rate Unit	Visual Percent Control			
				21 DAT		338 DAT	
1	Viewpoint MSO	8.25 1	OZ/A % V/V	90	*a*	90	*a*
2	Viewpoint MSO	12.5 1	OZ/A % V/V	90	*a*	93	*a*
3	Viewpoint MSO	16.5 1	OZ/A % V/V	90	*a*	93	*a*
4	Viewpoint MSO	19.84 1	OZ/A % V/V	87	*a*	93	*a*
5	Streamline MSO	4.76 1	OZ/A % V/V	90	*a*	93	*a*
6	Streamline MSO	11.44 1	OZ/A % V/V	90	*a*	93	*a*
7	MAT 28 MSO	3.76 1	OZ/A % V/V	67	*c*	40	*b*
8	MAT 28 MSO	9.04 1	OZ/A % V/V	73	*b*	30	*b*
9	Garlon 4 Arsenal MSO	64 16 1	FL OZ/A FL OZ/A % V/V	90	*a*	37	*b*
10	Milestone VM Roundup WeatherMAX Arsenal Activator 90	3.3 1.6 6.4 1	FL OZ/A QT/A FL OZ/A % V/V	90	*a*	37	*b*
11	Nontreated Check			0	*d*	0	*c*

Means within a column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.

Lespedeza Control in Pastures

Introduction

Sericea lespedeza (*Lespedeza cuneata)*, otherwise known as Chinese lespedeza, is a perennial leguminous forb native to Asia. Introduced in the late 1800s as a potential forage species, it was later used as a reclamation species planted on acidic and low fertility soils. It is grown in Kentucky for pasture, hay, and soil stabilization but can be invasive in some environments.

Sericea lespedeza can complement cool-season grasses in pasture with proper management. However it is naturally high in tannin, which can cause poor acceptance and performance in ruminants. In general, performance of cattle grazing sericea in Kentucky and other states has been poor because of poor animal acceptance and due to its naturally high tannin content. In grass-sericea pastures, grazing animals tend to eat the grass first and avoid sericea. In these cases, sericea becomes overmature and cannot support animal gains because of low forage quality (Henning et al. 1992).

Aminocyclopyrachlor (DPX-MAT28) is a synthetic auxin active ingredient developed by DuPont for the noncrop and invasive plant market as well as the range and pasture market. This herbicide has good activity against most legumes. Different rates of MAT28 by itself and in combination with other products were evaluated and compared with existing products for the control of sericea lespedeza in cool season grass pastures (Table 1).

Materials and Methods

The trial was established on a cooperator's pasture in Hopkins County. This pasture contained mostly tall fescue and lots of sericea lespedeza. The site was mowed to about 6 inches one month before treatments were applied. An eleven treatment randomized complete block trial with 4 reps and 10 ft x 40 ft plots was laid out. The treatments were applied at 15 gallons per acre on June 17, 2009. Most herbicide treatments included Activator 90 at 0.25% v/v while two MAT28 treatments (Trt. 2 and 4) had methylated seed oil (MSO) at 1% v/v as the adjuvant to compare with Treatments 1 and 3 (Table 1). Remedy and Overdrive are pasture herbicides with sericea lespedeza on their labels. The tall fescue was at 12 inches height while the lespedeza was at 14 inches. Visual percent control was assessed 13 (6/30/2009), 35 (7/22/2009), 54 (8/10/2009), and 406 (7/28/2010) days after treatment (DAT). Grass injury was assessed 13, 35, and 54 DAT. Data were analyzed using ARM software and treatment means were compared using Fisher's Protected LSD at $p = 0.05$.

Results

No grass injury was observed for any of the treatments 13, 35, or 54 DAT. The top group of treatments had 75 to 91% control 13 DAT. These included the Remedy, Overdrive, MAT28 at 3 and 4 oz/acre and MAT28 + Escort treatments (Table 1). The MAT28 + Telar and MAT28 + 2,4-D treatments were never in the top group of treatments and were not different

from the nontreated control 406 DAT. The MAT28 at 2 oz/acre with Activator 90 and Overdrive treatments were also not different from control 406 DAT.

The top group of treatments ranged from 63 to 94% control 406 DAT. These included the Remedy, MAT28 at 3 and 4 oz/acre and MAT28 + Escort treatments (Table 1). The MAT28 at 2 oz/acre treatments using different adjuvants (Trt. 1 and 2) were different 406 DAT with MSO showing greater control than Activator 90. It is possible that there was greater plant uptake with MSO. The most "promising" MAT28 mixture was with Escort at 85% control 406 DAT (Table 1).

Table 1. Treatments and Results for Lespedeza Control Trial

Trt. No.	Product Name	Rate	Rate Unit	Visual Percent Control			
				13 DAT	35 DAT	54 DAT	406 DAT
1	MAT 28 Activator 90	2 0.25	OZ/A % V/V	63 *d*	45 *d*	51 *cd*	20 *cd*
2	MAT 28 MSO	2 1	OZ/A % V/V	73 *bcd*	55 *cd*	73 *abcd*	48 *bc*
3	MAT 28 Activator 90	3 0.25	OZ/A % V/V	79 *abc*	68 *bc*	75 *abc*	63 *ab*
4	MAT 28 MSO	3 1	OZ/A % V/V	83 *abc*	75 *ab*	79 *ab*	65 *ab*
5	MAT 28 Activator 90	4 0.25	OZ/A % V/V	81 *abc*	78 *ab*	83 *ab*	63 *ab*
6	Remedy Activator 90	1.5 0.25	PT/A % V/V	91 *a*	93 *a*	98 *a*	94 *a*
7	Remedy Activator 90	0.75 0.25	PT/A % V/V	88 *ab*	88 *ab*	93 *a*	91 *a*
8	Overdrive Activator 90	8 0.25	OZ/A % V/V	75 *abcd*	53 *cd*	60 *bcd*	23 *cd*
9	MAT 28 Escort Activator 90	2 0.33 0.25	OZ/A OZ/A % V/V	89 *ab*	80 *ab*	87 *ab*	85 *a*
10	MAT 28 Telar Activator 90	2 0.16 0.25	OZ/A OZ/A % V/V	69 *cd*	45 *d*	50 *cd*	23 *cd*
11	MAT 28 2,4-D Amine (4 LBA/GAL) Activator 90	2 1 0.25	OZ/A PT/A % V/V	63 *d*	48 *cd*	48 *d*	10 *d*
12	Nontreated Check			0 *e*	0 *e*	0 *e*	0 *d*

Means within a column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.
No grass injury was observed 13, 35, and 54 DAT

References

Henning, J.C., N. L. Taylor, and G. D. Lacefield. 1992. Growing Lespedeza in Kentucky. University of Kentucky, College of Agriculture Extension Publication AGR-86

Clearcast for Cool Season Grass Seedhead Suppression

Introduction

Seasonal management of cool season grasses in rights-of-way includes mowing and herbicide applications to meet safety and aesthetic requirements. Application of plant growth regulators (PGRs) to suppress seedhead development and growth can reduce the number of time consuming and costly mowings. Some herbicides also have seedhead suppression effects, depending on the rate and timing of application. However, these products can injure the turf causing discoloration, which is undesirable but in many cases is temporary.

The cool season grasses may have their growth suppressed but weeds like johnsongrass may continue to grow and require additional spraying or mowing. The location of bodies of water are also a factor when spraying as some herbicides have label restrictions on how close to water one can spray. Milestone, Plateau, and Powerline are labeled for application to non-irrigation ditchbanks while Clearcast is labeled for aquatic and terrestrial uses. Plateau (imazapic) at 8 to 12 fl oz / acre is required to control johnsongrass which is enough to severely damage or kill tall fescue. To control seedling johnsongrass 16 fl oz / acre of Clearcast (imazamox) are called for while 32 to 64 fl oz are needed to control rhizome johnsongrass. Can Clearcast be used to suppress cool season grass seedhead growth at rates high enough to also control johnsongrass?

Materials and Methods

The trial was established on a site in Fayette County. Six herbicide treatments were arranged in a randomized complete block design with 4 reps. Plots were 10 ft x 30 ft with running unsprayed checks between each of the plots. All treatments included methylated seed oil (MSO) at 1% v/v and were sprayed April 1, 2009 at 20 gallons/acre. The tall fescue was 6 to 8 inches tall at application. All treatments included Milestone VM (aminopyralid) at 7 fl oz / acre to expand the range of weed species controlled (Table 1). Visual percent seedhead suppression was assessed by comparison to the running check strips 40 (5/11/2009) and 63 (6/3/2009) days after treatment (DAT). Tall fescue color was assessed by comparison to the running check strips 14 (4/15/2009), 40, and 63 DAT. The color rating ranges from 0 (dead) to 9 (full green). Data were analyzed using ARM software and treatment means were compared using Fisher's LSD at $p = 0.05$.

Results

All the treatments suppressed tall fescue seedhead growth 97 to 99% 40 and 63 DAT. The Clearcast at 32 fl oz / acre treatment had lower color ratings than the least damaged treatments 14 and 63 DAT. The lower rates of Clearcast (8 and 16 fl oz / acre) had color ratings the same as the Stronghold and Plateau at 2 fl oz / acre treatments 63 DAT. All the treatments except Plateau at 2 fl oz / acre suppressed bluegrass seedhead growth at least 90% 63 DAT. The Stronghold and Clearcast treatments suppressed orchard grass seedhead growth at least 85% 63 DAT. Clearcast should be considered for inclusion in roadside vegetation management programs.

Table 1. Treatments and Results for Clearcast Seedhead Suppression Trial

Trt. No.	Product Name	Rate	Rate Unit	Tall Fescue Color (1-9) 14 DAT		Tall Fescue Color (1-9) 40 DAT	Tall Fescue Color (1-9) 63 DAT		Tall Fescue % Seedhead Suppression 40 DAT	Tall Fescue % Seedhead Suppression 63 DAT		Bluegrass % Seedhead Suppression 63 DAT		Orchard Grass % Seedhead Suppression 63 DAT	
1	Plateau Milestone VM	4 7	FL OZ/A FL OZ/A	6.3	*ab*	5.5	6.8	*bc*	99	98	*b*	90	*a*	76	*bc*
2	Plateau Milestone VM	2 7	FL OZ/A FL OZ/A	6.5	*a*	7.0	8.0	*a*	97	99	*a*	64	*b*	57	*c*
3	Stronghold Arsenal Powerline Milestone VM	16 1.5 7	FL OZ/A FL OZ/A FL OZ/A	5.8	*ab*	6.0	7.8	*a*	99	99	*a*	90	*a*	85	*ab*
4	Clearcast Milestone VM	8 7	FL OZ/A FL OZ/A	6.5	*a*	5.3	8.0	*a*	99	99	*a*	97	*a*	85	*ab*
5	Clearcast Milestone VM	16 7	FL OZ/A FL OZ/A	6.3	*ab*	5.0	7.3	*ab*	97	99	*a*	99	*a*	99	*a*
6	Clearcast Milestone VM	32 7	FL OZ/A FL OZ/A	5.5	*b*	5.0	6.3	*c*	99	99	*a*	99	*a*	99	*a*
				ns		*ns*	*		*ns*	*ns*		*		*	

All herbicide treatments included 1% MSO v/v.

** Means within column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.*

ns Means within column followed by the same letter are not different according to Fisher's LSD at P < 0.05.

Fall Applications of Aminocyclopyrachlor (KJM44) for Biennial Weed Control

Introduction

Musk thistle, common teasel, and poison hemlock are all biennial herbaceous weeds that are commonly found on Kentucky roadsides. Musk thistle is on the noxious weed list in Kentucky. These biennial weeds are typically found in pastures, hayfields, roadsides, and other low maintenance areas. Research at the University of Kentucky has shown that the most effective timing application to control biennial species is either in the spring or fall when these plants are in the rosette stage of their life cycle.

Aminocyclopyrachlor (KJM44) is a pryimidine carboxylic acid herbicide with synthetic auxin mode of action in development for the noncrop and invasive plant market by DuPont. KJM44 is a methyl-ester formulation of the active ingredient. The objective was to compare the efficacy of KJM44 alone and in combination with Telar and Escort to other existing products.

Materials and Methods

The trial was located in a cloverleaf at the intersection of I – 265 (Gene Snyder Expressway) and Billtown Rd (exit 19) in Jefferson County, KY. Six herbicide treatments and an untreated check were evaluated in a randomized complete block design with 4 replications (Table 1). Plots, measuring 10' X 30', were treated at 20 GPA on December 3, 2008 using a CO_2 powered sprayer mounted on an ATV. Plots were evaluated 162 DAT (5/14/2009) to visually estimate percent control of the biennial weed complex. Data were analyzed using ARM software and treatment means were compared using Fisher's Protected LSD at $p = 0.05$.

Results

Although there was considerable variability in weed populations and in their control, all herbicide treatments resulted in some control of the biennials (Table 1). The three treatments (1-3) which included KJM44 provided control similar to each other and to the best treatment. The Milestone VM (aminopyralid) treatment resulted in less control than Milestone VM Plus (aminopyralid + triclopyr). This may be because Milestone VM has been found to be only somewhat effective on several species such as poison hemlock and buckhorn plantain. The addition of triclopyr in Milestone VM Plus increased its control of poison hemlock in the biennial complex.

Table 1. Treatments and Results for Fall Application Biennial Weed Control Trial

Trt. No.	Product Name	Rate	Rate Unit	% Poison Hemlock, Teasel, Musk Thistle Control 162 DAT	
1	KJM44 NIS	1.25 0.25	OZ/A % V/V	75	*ab*
2	KJM44 Telar NIS	1.25 0.5 0.25	OZ/A OZ/A % V/V	74	*ab*
3	KJM44 Escort NIS	1.25 0.5 0.25	OZ/A OZ/A % V/V	68	*ab*
4	Milestone VM NIS	5 0.25	FL OZ/A % V/V	44	*b*
5	Milestone VM Plus NIS	6.25 0.25	PT/A % V/V	93	*a*
6	2,4-D Amine (4 LBA/GAL) Telar	32 0.5	FL OZ/A OZ/A	66	*ab*
7	Nontreated Check			3	*c*

Means within column followed by the same letter are not different according to Fisher's Protected LSD at P < 0.05.