HERBICIDE EFFICACY AND TIME OF SPRAYING

Midsouth crop producers must use every available tool to get the most benefit from application of foliar-applied herbicides to control weeds, as well as ensure that applied herbicides are confined to the intended spray site. One of the oft-overlooked tools is how to time spraying of herbicides so they will have the greatest efficacy against targeted weeds, as well as have the least likelihood of moving off-site. The below table contains available information about the optimum time of day to spray indicated herbicides to realize their maximum efficacy against targeted weeds.

There is only speculation regarding the cause of reduced herbicide efficacy in the below-optimum spraying periods. Some possible factors that may be associated with this low efficacy during this time frame are:

- **Heavy dew that causes herbicide spray to drip from leaves.** Click here for more information.
- **Diurnal leaf movement or difference in leaf orientation of targeted weeds.** Many species have their leaves extended horizontally during the day, then dropping to nearly vertical at night. Results from an Arkansas study conducted by Norsworthy, Oliver, and Purcell titled "Diurnal Leaf Movement Effects on Spray Interception and Glyphosate Efficacy" showed that leaves of prickly sida, hemp sesbania, and sicklepod changed leaf angle [degrees from horizontal] from 2 to 32°, from 5 to 90°, and from 15 to 90°, respectively, from 4PM to 9PM. A 2 pt/acre rate of Roundup applied at those corresponding times resulted in a drop in control of the respective weeds from 90 to 65%, 92 to 22%, and 98 to 50%. Weed plants that had the greatest change in leaf angle from horizontal to vertical between day and night showed the largest drop in control from herbicide applied at night. These results and those from other studies indicate that leaf orientation may play an important role in reducing the efficacy of herbicides applied at night because of the lower interception of the spray material by leaves that are more vertically oriented during the nighttime hours.
- **Higher humidity and lower ambient temperature at night**. Weed physiological processes and responses at night that may be affected by lack of sunlight, thus causing changes in metabolic activity.

Two take-home points from the above summaries and the tabled data are:

- Even though guidance systems now allow growers to accurately apply herbicides during nighttime hours, the lowered efficacy of many of these herbicides on numerous weed species should dissuade this practice without verifying that targeted weeds will in fact be killed by efficacious herbicides applied at night.
- With the application of auxin herbicides on a widespread basis, the myriad potential reasons for low herbicide efficacy during the nighttime hours should be investigated so that definitive solutions can be developed that will allow spraying of these herbicides during times of lowest drift and volatilization potential.

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Time to spray indicated herbicides for greatest efficacy against targeted weeds.			
Herbicide or herbicide mix	**Targeted weed**	**Spray TOD***	**Greatest efficacy**
Culpepper [1], [2]			
Roundup [Glyphosate]	Palmer amaranth	<SR–SS>	10AM–7PM
Liberty [Glufosinate]			10AM–7PM
Reflex [Fomesafen]			8AM–7PM
Clarity [Dicamba]			8AM–7PM
2,4-D			8AM–7PM
Gramoxone [Paraquat]			6AM–9PM
Montgomery and Steckel			
Cheetah [Glufosinate]	Palmer amaranth	SR, 12N, SS	12N
Flexstar [Fomesafen]			12N
Ultra Blazer [Acifluorfen]			12N
Cobra [Lactofen]			12N
Cheetah + Flexstar			SR to SS
Reynolds			
Liberty	Barnyardgrass	12M, 6AM, 12N, 6PM	12N & 6PM
Select [Clethodim]			All times
Liberty + Select			12N & 6PM
Loux et al			
FirstRate [Cloransulam]	Various broadleafs	6, 9AM; 12N; 3, 6, 9PM; 12M	All times
Flexstar			9AM–6PM
Roundup			9AM–6PM
Roundup + 2,4-D		6AM; 4, 9PM	All times
Stoops et al [Control at 4 weeks after treatment]			
Roundup [Glyphosate]	Common ragweed Pigweed species Velvetleaf	6 , 9AM; 12N; 3, 6, 9PM; 12M	9AM-6PM
Basagran [Bentazon]			Poor control of all, no TOD effect
Classic [Chlorimuron-ethyl]			SR-SS (pigweed only)
Fomesafen [Reflex, Flexstar]			Variable control of all, no TOD effect
Pursuit [Imazethapyr]			9AM-6PM
Assure II [Quizalofop-p-ethyl]			Variable control of all, no TOD effect
Martinson et al [Control at 14 days after application]			
Glyphosate	Various annual species	6, 9AM; 12N; 3, 6, 9PM; 12M	9AM-6PM
Glufosinate			9AM-6PM
Montgomery et al [Control at 28 days after application]			
2,4-D	Horseweed	30 min. before SR; 12N; 30 min. after SS	Midday
Gramoxone [Paraquat]			SS
Clarity [Dicamba]			Midday
Liberty [Glufosinate]			Midday
Sharpen [Saflufenacil]			Midday, SS
*SR = sunrise; SS = sunset; 12N = 12 noon; 12M = 12 midnight.			