

Managing Waterhemp in Soybean with Layered Residual Herbicides – A Strategy for Controlling Glyphosate Resistant Waterhemp in Minnesota in 2015.

Breitenbach, Fritz R., Lisa M., Behnken, Jeffrey L. Gunsolus, and Ellen Sheehan.

The objective of this trial was to demonstrate and evaluate the effectiveness of layering soil residual herbicides for control of waterhemp in soybeans in southeastern Minnesota. Waterhemp seedlings emerge over an extended period of time, frequently outlasting the residual control achieved by herbicides applied before planting or crop emergence. Several residual herbicides may also be applied post-emergence to the crop alone or in combination with other post emergent herbicides. When activated by rainfall, these post-applied residual herbicides extend the duration of seedling waterhemp control. Three herbicides were evaluated in this study, 1) Dual II Magnum (s-metolachlor), 2) Outlook (dimethenamid-P), and 3) Warrant (acetochlor). These were selected because of their known effectiveness for controlling waterhemp and their flexibility of application timing. Pursuit (imazethapyr) does not control this population of waterhemp (ALS resistant); however, it was applied in tank mixes with the pre-emergent treatments to eliminate other non-target broadleaf weeds.

Materials and Methods:

The research site was a Lawler loam series with a pH of 6.7, O.M. 2.8% and soil test P and K levels of 34 ppm and 175 ppm respectively. The field was fall chisel plowed and spring disked and field cultivated once prior to planting. The previous crop was soybean. The soybean variety was Stine 22LD23 (LibertyLink) and was planted May 5, 2015 at a depth of 1.5 inches in 30 inch rows at a rate of 135,000 seeds per acre. A randomized complete block design was used with three replications. Preemergence (PRE) treatments were applied with a tractor-mounted sprayer delivering 15 gpa at 40 psi using TTI 110015 spray tips. Layered soil residual products were applied post emergence (POST I) with a tractor-mounted sprayer delivering 15 gpa at 30 psi using TTIJ60 nozzles (11002's). Evaluations of the plots were taken May 27, June 10, June 26, July 8 and September 29, 2015. The center two rows of each plot were machine harvested on October 13, 2015. Application dates, environmental conditions, and weed stages can be found in Table 1. Performance ratings for common waterhemp and common lambsquarters are in Tables 2 and 3. Grass control was satisfactory in all plots.

Summary:

1. Layered or sequential applications of Dual II Magnum, Outlook, or Warrant herbicide provided significantly better, season-long control of waterhemp compared to their PRE only treatments.
2. Control of common waterhemp by PRE only applications began to diminish by late June, about 45-60 days after planting (Table 2). Also, an open soybean canopy well into July allowed waterhemp to continue to emerge and compete with the crop (Figure 1).
3. Layered or PRE/POST applications of these herbicides provided significantly better, season-long control of waterhemp (90-95%) compared to their PRE only treatments, (62-81%), (9/29 rating, Table 2). Soybean yield was also higher in the layered treatments by 6-14 Bu/A compared to their PRE only counterpart. (Table 2).
4. Valor (flumioxazin) herbicide provided very good waterhemp control; significantly better than the Dual II Magnum, Outlook or Warrant PRE only treatments. However, late season observations indicated that waterhemp control does break when compared to the layered Dual II Magnum and Outlook treatments. However, with populations of waterhemp having confirmed SOA 14 resistance in Minnesota, relying solely on an SOA 14 herbicide may not be a sustainable. Layering an effective residual SOA 15 herbicide would make this a more durable system. This strategy will be evaluated in 2016.
5. This trial demonstrates that layering of effective residual herbicides is a strategy that could provide season long control of common waterhemp in Minnesota.

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Table 1. Application timing, plant stages, environmental conditions.

Date	5/5	6/8
Treatment	PRE	POST I
Temperature (F)		
Air	55	76
Soil	57.0	75.9
Relative Humidity (%)	83	51
Wind (mph)	20	12
Soil Moisture	Normal	Normal
Soybean		
Stage		V2
Height (inch)		6
Common Waterhemp		
Weed Density (ft ²)		51
Height (inch)		0
Rainfall after each application		
Week 1	1.53	1.64
Week 2	1.11	0.05
Week 3	1.15	1.95

Table 2. Common waterhemp control with preemergence control compared to preemergence followed by postemergence herbicides in soybeans in SE MN in 2015.

Treatment	Rate Unit	Applied	Percent (%) Common waterhemp control					Yield **
			5/27/15	6/10/15	6/26/15	7/8/15	9/29/15	Bu/A
SOA 2, 15			99	96 b	91 b	85 b	81 b	43 cd
DUAL II	1.5 pt/a	PRE						
MAGNUM								
Pursuit	4 fl oz/a	PRE						
SOA 2, 15 / 15			99	98 a	96 a	97 a	95 a	49 ab
DUAL II	1.5 pt/a	PRE						
MAGNUM								
Pursuit	4 fl oz/a	PRE						
DUAL II	1.0 pt/a	POST I						
MAGNUM								
SOA 2, 15			99	96 b	85 c	73 c	71 c	40 d
OUTLOOK	18 fl oz/a	PRE						
Pursuit	4 fl oz/a	PRE						
SOA 2, 15 / 15			99	98 a	97 a	97 a	94 a	51 a
OUTLOOK	14 fl oz/a	PRE						
Pursuit	4 fl oz/a	PRE						
OUTLOOK	10 fl oz/a	POST I						
SOA 2, 15			99	91 c	82 c	69 c	62 d	32 e
WARRANT	1.6 qt/a	PRE						
Pursuit	4 fl oz/a	PRE						
SOA 2, 15 / 15			98	95 b	95 ab	94 a	90 a	46 bc
WARRANT	1.6 qt/a	PRE						
Pursuit	4 fl oz/a	PRE						
WARRANT	1.6 qt/a	POST I						
SOA 2, 14			99	97 a	96 a	94 a	89 a	51 a
VALOR SX	3 oz/a	PRE						
Pursuit	4 fl oz/a	PRE						
LSD P=0.10 for weed control and P=0.20 for yield			NS	1.5	4.4	6.2	6.3	4.1

Means followed by same letter do not significantly differ

*PRE – Applied immediately after planting, POST I - Applied on June 8, 2015

** Pursuit weedy check yielded 14 bu/a.

Table 3. Common lambsquarters control with preemergence compared to preemergence followed by postemergence herbicides in soybeans in SE MN in 2015.

Treatment	Rate Unit	Applied *	Percent (%) Common lambsquarters control					Yield
			5/27/15	6/10/15	6/26/15	7/8/15	9/29/15	Bu/A
1 SOA 2, 15 DUAL II MAGNUM Pursuit	1.5 pt/a 4 fl oz/a	PRE PRE	99 ab	99	96 c	92 c	92 c	43 cd
2 SOA 2, 15 / 15 DUAL II MAGNUM Pursuit DUAL II MAGNUM	1.5 pt/a 4 fl oz/a 1.0 pt/a	PRE PRE POST I	98 bc	99	98 ab	97 ab	97 ab	ab
3 SOA 2, 15 OUTLOOK Pursuit	18 fl oz/a 4 fl oz/a	PRE PRE	99 ab	99	98 b	98 ab	98 ab	40 d
4 SOA 2, 15 / 15 OUTLOOK Pursuit OUTLOOK	14 fl oz/a 4 fl oz/a 10 fl oz/a	PRE PRE POST I	98 ab	99	99 a	98 ab	98 ab	51 a
5 SOA 2, 15 WARRANT Pursuit	1.6 qt/a 4 fl oz/a	PRE PRE	97 c	99	98 ab	97 b	97 b	32 e
6 SOA 2, 15 / 15 WARRANT Pursuit WARRANT	1.6 qt/a 4 fl oz/a 1.6 qt/a	PRE PRE POST I	98 ab	99	99 a	99 a	99 a	46 bc
7 SOA 2, 14 VALOR SX Pursuit	3 oz/a 4 fl oz/a	PRE PRE	99 a	99	96 a	98 ab	98 ab	51 a
LSD P=0.10 for weed control and P=0.20 for yield			1.2	ns	1.3	2.2	2.2	4.1

Means followed by same letter do not significantly differ

*PRE – Applied immediately after planting, POST I - Applied on June 8, 2015

** Pursuit weedy check yielded 14 bu/a.



Figure 1. Comparison of weed control in soybean with a single preemergence, May 5, application of Outlook (left) and layered applications of Outlook on May 5 and June 8 (right). Top photos taken on July 14, 2015. Bottom photos taken three weeks later on August 6, 2015.

