

Imazapyr Combinations for Utility Brush Control

Introduction

Utility and other non-crop vegetation managers rely on herbicides as an effective tool to control undesirable woody vegetation. Common tank mixes include imazapyr plus glyphosate, imazapyr plus fosamine, and other combinations that may include metsulfuron methyl or triclopyr. Unfortunately, the introduction of new herbicides or reformulations of existing chemistry in the woody plant market has been slow to nonexistent over the past 10 years. Arsenal® Powerline™, a new formulation of the 2lb active ingredient per gallon Arsenal, was introduced by BASF Corp. in 2007. The new formulation boasts increased uptake and faster efficacy through ‘patented uptake technology’ than the older Arsenal. A trial was installed in 2007 to compare Arsenal Powerline to Arsenal both alone and in combinations with fosamine and glyphosate. For discussion purposes, the new formulation of Arsenal Powerline will be referred to herein as Powerline while the old formulation of Arsenal will be referred to as Arsenal.

Methods and Materials

The study was located on a 3-year-old transmission line managed by East Kentucky Power near Clay City, Kentucky. Predominant woody species included yellow poplar, red maple, sourwood, pignut hickory, northern red oak, pitch pine, and Alleghany blackberry all with variable density. Height of target woody plants ranged from 1’ to 8’. Plots measured 15’ by 30’ and were installed to maximize woody plants per plot in a randomized complete block design with 3 replications. A preapplication census was taken to record total number of target stems by species for each plot. Plots were treated at 30 GPA using a CO₂ backpack and an adjusted cone tip handgun on August 17, 2007. Plots were evaluated for necrosis 35 DAT on September 21, 2007 and 1 YAT on August 4, 2008. Control data by species and average control across all species were analyzed using ARM software and treatment means were separated using Fisher’s LSD at $p = 0.05$.

Results

35 DAT

Yellow Poplar

Arsenal at 16 fl oz / ac in combination with 4 qt / ac of Accord resulted in the highest level of control of yellow poplar 35 DAT (Table 1). This was significantly higher than the 12 fl oz of Powerline, Arsenal at 16 fl oz, Powerline at 16 fl oz plus Krenite at 3 qt, and Powerline at 12 fl oz plus 2 qt of Accord.

Red Maple

Powerline alone at 16 fl oz resulted in significantly higher burndown or necrosis than Arsenal alone at the same rate of red maple 35 DAT. Powerline at 16 fl oz in combination with Accord at 2 qt resulted in significantly greater burndown than all other treatments except Arsenal at 16 fl oz and the higher 4 qt rate of Accord.

Sourwood

There were no differences in the initial sourwood burndown between the Powerline and Arsenal alone treatments 35 DAT. Powerline at 12 fl oz plus Krenite at 6 qt and Arsenal at 16 fl oz plus Krenite at 6 qt resulted in significantly higher initial burndown of sourwood 35 DAT than Powerline at 16 fl oz and the lower 3 qt rate of Krenite.

Pitch Pine

The only significant difference in burndown of pitch pine 35 DAT occurred between Arsenal at 16 fl oz plus Accord 4 qt (53 %) and Powerline at 16 fl oz plus the low 3 qt rate of Krenite (10 %). It is known that imazapyr has little to no effect pines at the rates tested and results presented here are in agreement.

Pignut Hickory

There were no statistical differences between any treatments for pignut hickory control 35 DAT. Burndown / necrosis ranged from 15 % for Arsenal at 16 fl oz to 40 % for Powerline at 12 and 16 fl oz.

Northern Red Oak

There were no statistical differences between the Powerline alone treatments and the Arsenal alone treatment for northern red oak burndown 35 DAT. Burndown percentages for these treatments were fairly low compared to other species tested as percentages ranged from 10 % for Powerline at 12 fl oz to 20 % for Powerline at 12 fl oz. The addition of Krenite or Accord appears to hasten burndown of northern red oak as Powerline at 12 fl oz plus Krenite at 6 qt, Arsenal at 16 fl oz plus Krenite at 6 qt, Powerline at 16 fl oz plus Accord at 2 qt, and Arsenal at 16 fl oz plus Accord at 4 qt resulted in significantly higher percent necrosis than Powerline alone at 16 fl oz and Arsenal alone at 16 fl oz.

Overall Woody Plant Necrosis 35 DAT

Arsenal at 16 fl oz plus Accord at 4 qt resulted in significantly higher average necrosis for all species evaluated. There were no differences between Powerline at 16 fl oz plus the low rate of Accord at 2 qt, Powerline at 16 fl oz plus the low rate of Krenite at 3 qt, Powerline at 12 fl oz plus the high rate of Krenite at 6 qt, and Arsenal at 16 fl oz + the high rate of Krenite at 6 qt. The low rate of Powerline (12 fl oz) plus the low rate of Accord (2 qt) resulted in one of the lowest average necrosis percentages across all species at 29 %. This was not statistically different than Powerline alone at 16 or 12 fl oz. Arsenal alone at 16 fl oz resulted in the statistically lowest percent necrosis 35 DAT at 19 %. This is indicative of Arsenal's traditionally long time to visual symptomology.

1YAT

Red Maple

Powerline at 12 and 16 fl oz per acre resulted in significantly higher control of red maple than Arsenal at 16 fl oz / ac 1 YAT (Table 2). This was indicative of the increased herbicide uptake through BASF's 'patented uptake technology'. All combinations of

Arsenal and Accord, Arsenal and Krenite, Powerline and Accord, and Powerline and Krenite resulted in statistically similar control of red maple 1YAT.

Sourwood

There were no statistical differences in control between any herbicide treatment for the control of sourwood 1 YAT (Table 2). There appears to be an operational difference; however, as Arsenal alone at 16 fl oz / ac resulted in 67 % control of sourwood 1 YAT while the 2 Powerline alone treatments resulted in control > 95% 1 YAT.

Pitch Pine

A high degree of variance existed in the control of pitch pine 1 YAT data set (CV = 100.84, Table 2). This was influenced by the selectivity imazapyr has to pine species as well as the wide range of control levels of the tank mix treatments. Although not statistically different, tank mixes that included Krenite generally had higher control of pitch pine 1 YAT than tank mixes using Accord.

Northern Red Oak

There were no statistical differences between any treatments for the control of northern red oak 1 YAT (Table 2). All treatments resulted in control levels > 95%.

Overall Harwood Species Control

All treatments were effective in controlling hardwood species 1 YAT (Table 2). Although no statistical differences were detected across any treatment, Arsenal alone at 16 fl oz / ac resulted in the lowest control of hardwood species (88 %). This is undoubtedly influenced by the poor red maple control provided by Arsenal alone discussed earlier.

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Table 1: Treatments and results for Clay City Powerline /Arsenal Utility Brush Trial 35 DAT

Treatment	Rate per acre	Percent Brownout / Necrosis 35 DAT							
		Yellow-poplar	Red maple	Sourwood	Pitch Pine	Pignut hickory	Northern red oak	Overall	Allegheny blackberry
Powerline	16 fl oz	25 ab	45 cd	65 ab	0 c	40 a	10 c	34 de	22 cd
Powerline	12 fl oz	20 b	31 de	60 ab	0 c	40 a	20 bc	36 de	17 d
Arsenal	16 fl oz	20 b	26 e	60 ab	0 c	15 a	13 c	19 f	13 d
Powerline + Krenite	16 fl oz + 3 qt	20 b	61 b	55 b	10 bc	40 a	25 b	41 cd	43 ab
Powerline + Krenite	12 fl oz + 6 qt		68 ab	80 a	37 ab	30 a	30 ab	47 bc	25 bcd
Arsenal + Krenite	16 fl oz + 6 qt	50 ab	54 bc	80 a	40 a	40 a	30 ab	50 b	50 a
Powerline + Accord	16 fl oz + 2 qt	30 ab	81 a	60 ab	33 ab	20 a	30 ab	48 bc	40 abc
Powerline + Accord	12 fl oz + 2 qt	10 b	30 e	60 ab	0 c	20 a	20 bc	29 e	27 bcd
Arsenal + Accord	16 fl oz + 4 qt	70 a	67 ab	70 ab	53 a	35 a	40 a	60 a	33 a-d
Std Dev		18	8	11	16	16	6	5	12
CV		59	16	17	84	50	25	12	41

Note: Treatment means in the same column followed by the same letter are not statistically different using Fisher's LSD at $p = 0.05$. All treatments included a NIS at 0.25 % v/v.

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Table 2: Treatments and results for Clay City Powerline /Arsenal Utility Brush Trial 1 YAT

Treatment	Rate per acre	Percent Control 1 YAT				
		Red maple	Sourwood	Pitch Pine	Northern Red Oak	Overall Hardwood Control
Powerline	16 fl oz	100 a	100 a	0 b	99 a	98 a
Powerline	12 fl oz	94 a	96 a	0 b	100 a	99 a
Arsenal	16 fl oz	35 b	67 a	0 b	96 a	88 a
Powerline + Krenite	16 fl oz + 3 qt	88 a	100 a	67 a	100 a	96 a
Powerline + Krenite	12 fl oz + 6 qt	89 a	100 a	61 ab	99 a	97 a
Arsenal + Krenite	16 fl oz + 6 qt	93 a	100 a	81 a	100 a	99 a
Powerline + Accord	16 fl oz + 2 qt	80 a	100 a	51 ab	100 a	98 a
Powerline + Accord	12 fl oz + 2 qt	94 a	100 a	33 ab	100 a	99 a
Arsenal + Accord	16 fl oz + 4 qt	60 ab	100 a	38 ab	100 a	93 a
Std Dev		23.28	19.72	37.05	2.84	7.25
CV		28.62	20.57	100.84	2.86	7.51

Note: Treatment means in the same column followed by the same letter are not statistically different using Fisher's LSD at $p = 0.05$. All treatments included a NIS at 0.25 % v/v.