

# Differential Morphology of Morningglory Populations from the Southern U.S.

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## INTRODUCTION

Morningglories are very important weeds and are frequently some of the most difficult-to-control broadleaf weeds in row crop and other agricultural and non-agricultural areas in the southeastern U.S. Morningglories are very competitive and reduce both crop yields and harvest efficiency. In a survey, McWhorter and Barrentine (1988) found that morningglories were the most troublesome weeds in the U.S., regardless of the agricultural system. Morningglories are the most important and troublesome weedy genus in southern row crop production (Webster 2000; Webster 2001). This group is comprised of several species. Of the assemblage that comprise the weedy morningglories in the southeastern United States, pitted morningglory seems to be one of the most variable in terms of morphology and control with glyphosate.

Little is known about the diversity of leaf shape and other macro-morphological characteristics in the morningglory species as related to herbicide efficacy, tolerance, and resistance. Leaf shape, in the ivyleaf-entireleaf morningglory complex [*Ipomoea hederacea* (L.) Jacq.], is due to a single gene difference and the ivyleaf shape is the dominant allele (Elmore 1986a). Despite the dominance of the ivyleaf trait, the entireleaf phenotype is more abundant than ivyleaf phenotypes in many fields in the Mississippi Delta Region and may be due to herbicide selectivity (Elmore 1986b).

Experiments were initiated in 2005 because pitted morningglory (*Ipomoea lacunosa* L.) susceptibility to herbicides varied and little was known about the morphological diversity among its biotypes and a closely related species sharppod morningglory (*Ipomoea cordatotriloba* Dennstedt) and a fertile hybrid (*Ipomoea x leucantha* Jacq.) between pitted morningglory and cotton morningglory as described by Abel and Austin (1981) and Austin and Huáman (1997). Research was expanded in 2006 to include additional morningglory species with objectives to 1) identify macro-morphological parameters for distinguishing morningglory species; 2) determine variability in growth characteristics of weedy morningglories; and 3) develop a database to eventually correlate with herbicide efficacy and herbicide tolerance/resistance issues.



## MATERIAL AND METHODS

Seed were collected from several southeastern states during the falls between 2003 and 2005 of the following species: a fertile purported hybrid between sharppod and pitted morningglory, pitted morningglory, sharppod morningglory, cypressvine morningglory (*I. quamoclit* L.), ivyleaf morningglory [*I. hederacea* (L.) Jacq.], palmleaf morningglory (*I. wrightii* Gray), purple moonflower (*I. turbinata* L.), red morningglory (*I. coccinea* L.), and smallflower morningglory [*Jacquemontia taminifolia* (L.) Gresh.]. Ten morningglory plants from each accessions (1 plant/pot) were grown in a greenhouse during 2005 and 2006 at Stoneville, MS. Morningglory seedlings were established in the greenhouse in 30 by 45 cm trays and transplanted into 15 cm-diam pots. Growth media was a mixture of a Bosket sandy loam (Mollis Hapludalfs) soil and commercial potting mix (Jiffy Mix, a registered trademark of

future, these morphological traits will be compared to determine if any of these traits or group of traits may be correlated with herbicide efficacy and herbicide tolerance.



Morphological characteristics of nine morningglory species collected in the Southeastern United States.

<i>Ipomoea/Jacquemontia</i>	Leaf area	Dry leaf wt.	Node to first elongation	Flower <sup>1</sup>	Corolla diameter	Corolla length	Leaf <sup>2</sup>	Petiole <sup>2</sup>
-- species --	-- mm <sup>2</sup> --	-- mg --	-- no. --	-- color --	-- cm --	-- cm --	-- pubescence --	
<i>I. coccinea</i>	6190 ± 140		3 ± 1	S	12.2 ± 0.5	27.1 ± 0.5	-	-
<i>I. cordatotriloba</i>	4290 ± 260	110 ± 10	3 ± 1	L	32.2 ± 2.5	35 ± 1.8	±	±
<i>I. hederacea</i>	6180 ± 140	200 ± 4	3 ± 1	B	36.3 ± 1.3	42.4 ± 0.4	±	±
<i>I. lacunosa</i>	4530 ± 140	120 ± 1	3 ± 1	W	16.6 ± 0.5	18.7 ± 0.2	±	±
<i>I. quamoclit</i>	590 ± 12	50 ± 1	10 ± 2	R	20.5 ± 0.7	34.2 ± 0.4	-	-
<i>I. turbinata</i>	15520 ± 450	570 ± 20	3 ± 1	L	49.2 ± 1.3	71.2 ± 1.3	-	-
<i>I. wrightii</i>	5100 ± 90	150 ± 1	3 ± 1	L	27 ± 1.6	21.5 ± 0.3	-	-
<i>I. x leucantha</i>	4850 ± 110	140 ± 8	3 ± 1	L, P, W	18.3 ± 2.4	19.2 ± 3.4	±	±
<i>J. taminifolia</i>	4160 ± 160	120 ± 1	4 ± 1	B	14.2 ± 0.7	12.9 ± 0.4	±	±

<sup>1</sup> Color: Blue-B; Lavender - L; Pink - P; Red - R; Scarlet - S; and White - W. <sup>2</sup> Pubescence: + pubescent; - not pubescent; ± some pubescent others not.



Jiffy Products of America, Inc., Batavia, IL) at 1:1, v/v. The greenhouse was maintained at temperatures of 20/30 C night/day. Data from individual live and dried plants were recorded including leaf shape, size, dry weight, and pubescence; corolla size and color; calyx length, color and pubescence; stem color, pubescence, and number of nodes to first internode elongation; and other morphological characteristics with the goal of developing baseline data to eventually correlate with herbicide efficacy and herbicide tolerance/resistance issues.

## RESULTS AND DISCUSSION

The greatest morphological diversity within accessions was observed among pitted, sharppod, and the hybrid morningglory accessions. Corolla color was white, lavender, and varied from light pink to lavender in pitted, sharppod, and hybrid morningglory populations, respectively. Leaf shape and pubescence varied more among pitted and the hybrid morningglory accessions than among sharppod morningglory and other morningglory accessions. Leaves and petioles were smooth for cypressvine, palmleaf, and red morningglory accessions and pubescent for ivyleaf and smallflower morningglory accessions. However, for pitted, sharppod, and the hybrid morningglories, pubescence on leaves and petioles varied among and within accessions. Flower diameter and length was more variable for the hybrid morningglory accessions compare to other accessions within species. In the

## CONCLUSIONS

Some morphological traits overlap and other traits differ among and within morningglory populations in the southeastern U.S.

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