

Early Season Defoliation Affects Tassel Development in Corn

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INTRODUCTION

In addition to reducing vegetative growth, shortening plant and ear height, and delaying anthesis (Mangen et al., 2015), early-season defoliation of corn can result in stunted and sterile tassels (Monsanto, 2014). However, information documenting effects of defoliation on tassel development is limited. In a recent multistate study (Thomison et al., 2017) evaluating multiple defoliation events on grain yield at V8, V13 and VT, defoliation at V8 (Abendroth et al., 2011) resulted in tassel deformation. Little is known concerning differences in hybrid sensitivity and early season vegetative stages susceptible to tassel deformities following defoliation injury.

OBJECTIVE

To determine effects of early season defoliation (at V5, V8, and V10) on tassel deformation in three corn hybrids.

METHODS

- Field experiments were conducted at S. Charleston, OH in 2016 and 2017.
- 3 m x 3 m plots were planted in a randomized complete block design with four replications.
- Three hybrids with maturity ratings ranging from 107-114 d were planted at 88,900 seeds ha⁻¹ in 0.76 m rows each year (Table 1).
- One non-defoliated control (NDC) and a defoliation treatment consisting of removing 100% of the leaves plus 60% of the whorl was imposed at two stages in 2016 – V5 and V8 and three stages in 2017 – V5, V8 and V10. (Fig. 1).
- Tassel appearance of plants in the center two rows was visually assessed (Fig. 2).



Fig. 1. 100% defoliation at V5, S. Charleston, OH, 2017.



Fig. 2. Tassel ratings 1 to 3 scale: 1 = normal tassel (left), 2 = tassel with some skeletal properties and reduced number of spikelets (center), 3 = mostly skeletal tassel with no spikelets (right).

- Ten tassels from the NDC plots and 10 tassels from plots that were defoliated 100% at V8 were evaluated to determine tassel length and numbers of branches per tassel. Tassel length was measured from the last collared leaf to the tip of the tassel (Fig. 2).
- Tassel ratings were square-root transformed for analysis with back-transformed means presented.
- Analysis was conducted using PROC GLIMMIX with replication as random factor and hybrid and defoliation treatments as fixed factors.

RESULTS AND DISCUSSION

Table 1. Hybrid and defoliation effects on tassel deformity rating, S. Charleston, OH, 2016-2017.

Year	Hybrid	Defoliation Treatment	Tassel Deformity Rating†		
2016	DeKalb DKC61-88	NDC	1.0C		
		100% @V5	1.0C		
		100% @V8	2.8A		
		Pioneer P1498R	NDC	1.0C	
			100% @V5	1.0C	
			100% @V8	1.3B	
	Pioneer P1197AM	NDC	1.0C		
		100% @V5	1.0C		
		100% @V8	1.2B		
	<i>P-value</i>				
	Hybrid (H)			<0.001	
	Def. Treatment (D)			<0.001	
H x D			<0.001		
2017	DeKalb DKC61-88	NDC	1.0C		
		100% @V5	1.0C		
		100% @V8	2.6A		
		100% @V10	1.1C		
		Pioneer P1498AM	NDC	1.0C	
			100% @V5	1.0C	
	100% @V8		1.0C		
	DeKalb DKC57-97	NDC	1.0C		
		100% @V5	1.0C		
		100% @V8	2.6A		
	100% @V10	1.3B			
		<i>P-value</i>			
		Hybrid (H)			<0.001
	Def. Treatment (D)			<0.001	
	H x D			<0.001	

†tassel ratings 1 = normal tassel; 2 = tassel with some skeletal properties (reduced number of anthers), 3 = mostly skeletal (no anthers present).

- Susceptibility to defoliation induced tassel deformation differed markedly among hybrids and was most pronounced in DKC61-88VT3Pro (in 2016 and 2017) and DKC57-97RIB (in 2017) (Table 1 and Fig. 3).
- Defoliation induced tassel deformation was only evident at V8 (Table 1).
- Tassel lengths were reduced 40% by 100% defoliation at V8 in the hybrids exhibiting tassel deformation whereas tassel lengths were reduced 10-13% in the hybrid with little or no tassel deformation (Table 2).



Fig. 3. NDC (left) vs. 100% defoliation at V8 (right) in 107, 111 and 114 day hybrid (left to right), S. Charleston, OH 2017.

Table 2. Hybrid and defoliation treatment effects on tassel length and tassel branches, 2016-2017 defoliation study, S. Charleston, OH.

Year	Hybrid	Defoliation Treatment	Tassel Length†	Tassel Branches†
			--cm--	----no.----
2016	DeKalb DKC61-88	NDC	44.2B	9.9A
		100% @V8	26.1C	9.5A
	Pioneer P1498R	NDC	48.9A	4.2C
		100% @V8	44.2B	4.0C
	Pioneer P1197AM	NDC	48.0A	8.1B
100% @V8		41.7B	8.6B	
<i>P-value</i>				
Hybrid (H)			<0.001	<0.001
Def. Treatment (D)			<0.001	0.670
H x D			<0.001	0.186
2017	DeKalb DKC61-88	NDC	46.4B	8.8A
		100% @V8	24.7D	8.7A
	Pioneer P1498AM	NDC	52.9A	4.9C
		100% @V8	44.3BC	5.1C
	DeKalb DKC57-97RIB	NDC	40.8C	7.2B
100% @V8		27.0D	6.8B	
<i>P-value</i>				
Hybrid (H)			<0.001	<0.001
Def. Treatment (D)			<0.001	0.779
H x D			0.003	0.561

†Based on a sample of 10 tassels from NDC plots and 10 tassels from plots that were defoliated. Tassel length was measured from last collared leaf to the tip of the tassel.

- Difference in tassel branch numbers among hybrids were small and no consistent reduction in branch number was associated with defoliation at V8 (Table 2).
- Defoliation induced tassel deformation may be greater at V8 because spikelet formation occurs at this stage (Stevens et al., 1986).

CONCLUSIONS

- Results suggest that hybrids exhibit a differential response to defoliation for tassel deformation.
- Susceptibility to defoliation induced tassel deformation appears to be present after V5 and before V10.
- Extensive tassel deformation within a large field could result in poor pollination and reduced yield.

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