2021 Water Resiliency Corn Hybrid Water Stress Performance Trials, Plymouth NC

The following report reflects the first annual corn hybrid water stress trials at the Total Ag Water Management site at the Tidewater Research Station in Plymouth, NC. This work is sponsored by the NC Corn Growers Association. The goal of these performance trials is to evaluate elite commercially available corn hybrids to water stress conditions. The trial artificially imposes water stress during the growing season under a uniform soil type and observed natural precipitation. The hybrids were randomized and replicated four times across water treatments. The trials were planted May 4 and harvested September 21, 2021.

Treatments defined: ****There is no way to control natural precipitation at the site during a given year, all treatments see the same natural rainfall which will determine the final level of dry stress during the growing season.***

Intensive Drainage- This treatment was intended to create dryer than normal conditions. The tile spacing is 37.5' which is highly intensive tile drainage for a Portsmouth fine sandy loam soil and provides a much higher drainage intensity than needed for efficient crop production in this soil series. No irrigation was applied to this treatment. This treatment was intended to remove wet stress and impose dryer than normal conditions during the growing season. It would be most typical of a well-drained condition in NC.

Adequate- This treatment was intended to create ideal conditions representative of economically efficient water management systems. The tile spacing was set to 75' which is a typical recommended tile spacing for the Portsmouth series soil in the Lower Coastal Plain and Tidewater regions of North Carolina. Surface drip irrigation was utilized to apply water during dryer than normal periods.

Wet- This treatment was intended to create wet stress conditions. Tile drainage at 37.5' spacing and outlets controlled at 1.5' deep coupled with subsurface tile irrigation at 1.5' from the ground plus surface drip irrigation was utilized to impose wet stress. The drainage outlet was not allowed to free flow unless the groundwater was between 0' and 1.5' below the surface. Irrigation water was continually pumped into the drainage system if the water table fell below 1.5'. This treatment would be representative of valleys, local depressional areas, frequently flooded river bottoms, and tidal controlled drainage areas during most growing seasons. It would be similar to poorly drained and very poorly drained fields with little surface or subsurface drainage capacity.

2021 Growing Season, Plymouth, NC

The 2021 growing season (Jun-Aug) experienced precipitation that was 67% above the historic (1933-2020) average in Plymouth, NC. Due to the frequency of events, precipitation quantity, and numerous days during the growing season with low radiation, minimal drought stress was observed in any treatment (Figure 1). Greater wet stress was observed in both the Adequate and Wet treatments compared to the Intensive Drainage treatment (Figure 2). The Wet treatment had significant impact on grain yields in all relative maturities. Significant differences in hybrid yields were observed among full season (≥116 RM) and early season (<110 RM).

Figure 1. June-September precipitation and potential evapotranspiration for Plymouth, NC

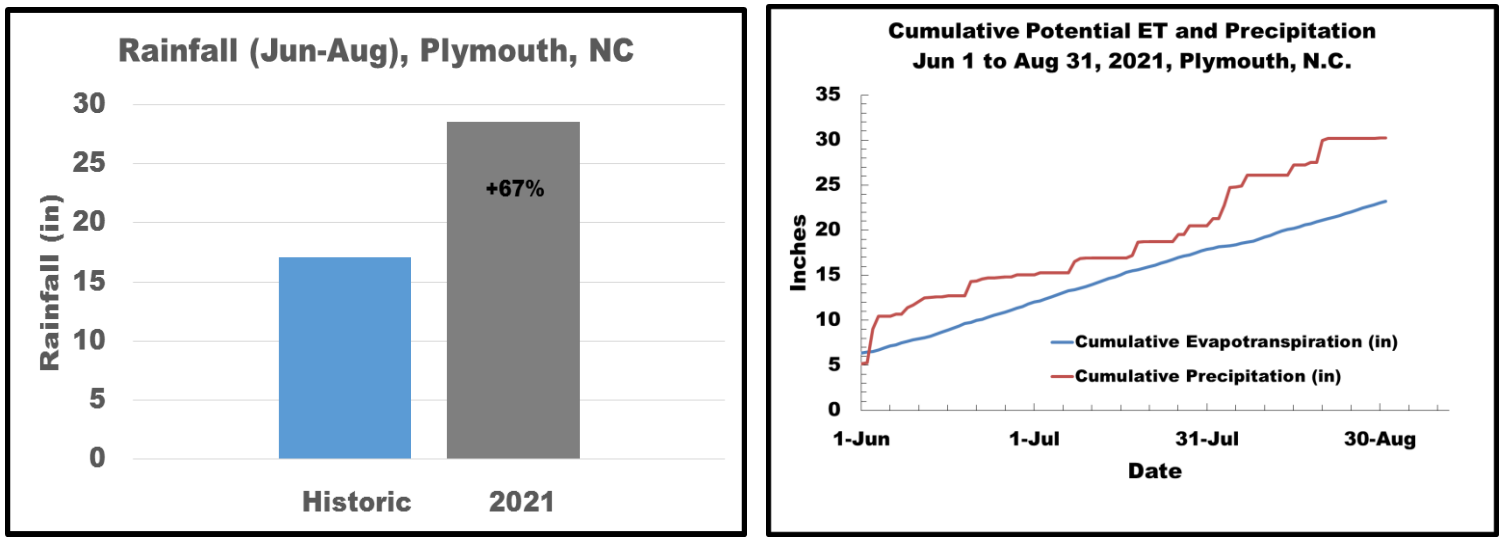
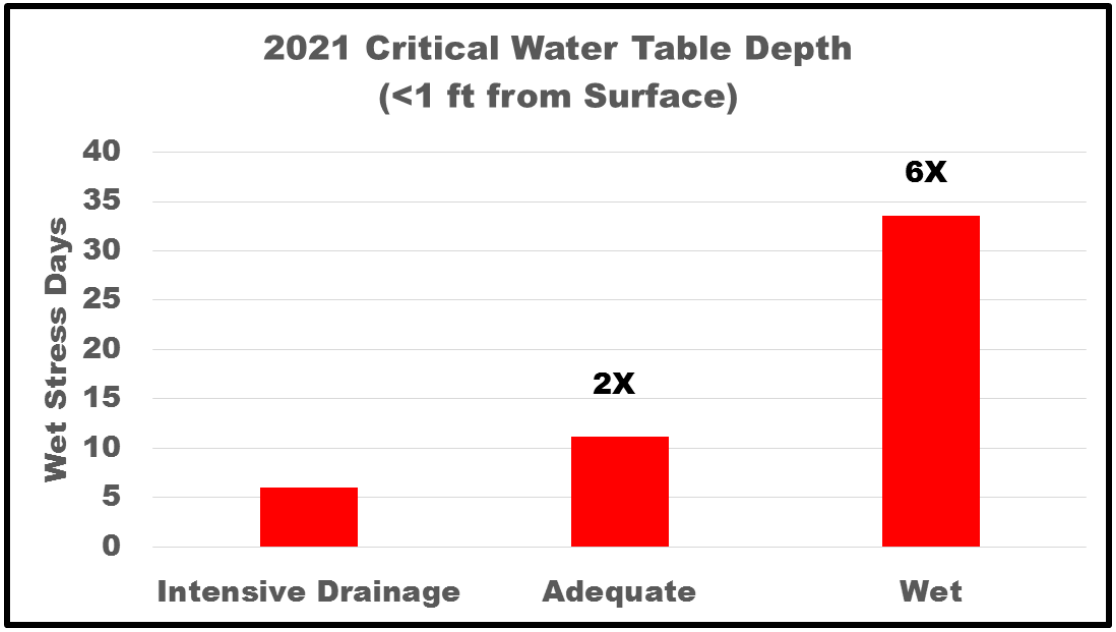


Figure 2. Critical Water Table levels for Wet Stress 2021.



2021 Water Resiliency Corn Hybrid (≥116 RM) Water Stress Performance Trials, Plymouth, N.C.

Intensive Drainage

Full Season (≥116 RM) Hybrid Performance
Rainfed, intensively tile drained @ 37.5' o.c.*

Company/Brand	*Entry*	*Yield, bu/acre*
Pioneer	1870YHR	188.8
DeKalb	68-69	188.4
Dyna-Gro	58-65	186.4
NK Syngenta	1677	182.2
AgVenture	9916AM	181.3
NK Syngenta	1748	159.6
	Mean	181.1
	CV	9.2
	$LSD_{0.05}$	15.8
	n	24
	***p*-Value**	0.011

Entries highlighted in green are not different
*on-center

Adequate

Full Season (≥116 RM) Hybrid Performance
Adequate moisture, tile drained @ 75' o.c.

Company/Brand	*Entry*	*Yield, bu/acre*
NK Syngenta	1677	181.2
Pioneer	1870YHR	176.0
Dyna-Gro	58-65	164.2
AgVenture	9916AM	160.4
DeKalb	68-69	152.5
NK Syngenta	1748	144.6
	Mean	163.1
	CV	15.7
	$LSD_{0.05}$	25.3
	n	24
	***p*-Value**	0.061

Entries highlighted in green are not different

Wet Stress

Full Season (≥116 RM) Hybrid Performance
Wet, tile undrained @ 37.5' o.c.

Company/Brand	*Entry*	*Yield, bu/acre*
AgVenture	9916AM	125.9
NK Syngenta	1677	121.3
Pioneer	1870YHR	119.8
Dyna-Gro	58-65	113.0
DeKalb	68-69	87.4
NK Syngenta	1748	81.6
	Mean	108.2
	CV	22.7
	$LSD_{0.05}$	24.7
	n	24
	***p*-Value**	0.005

Entries highlighted in green are not different

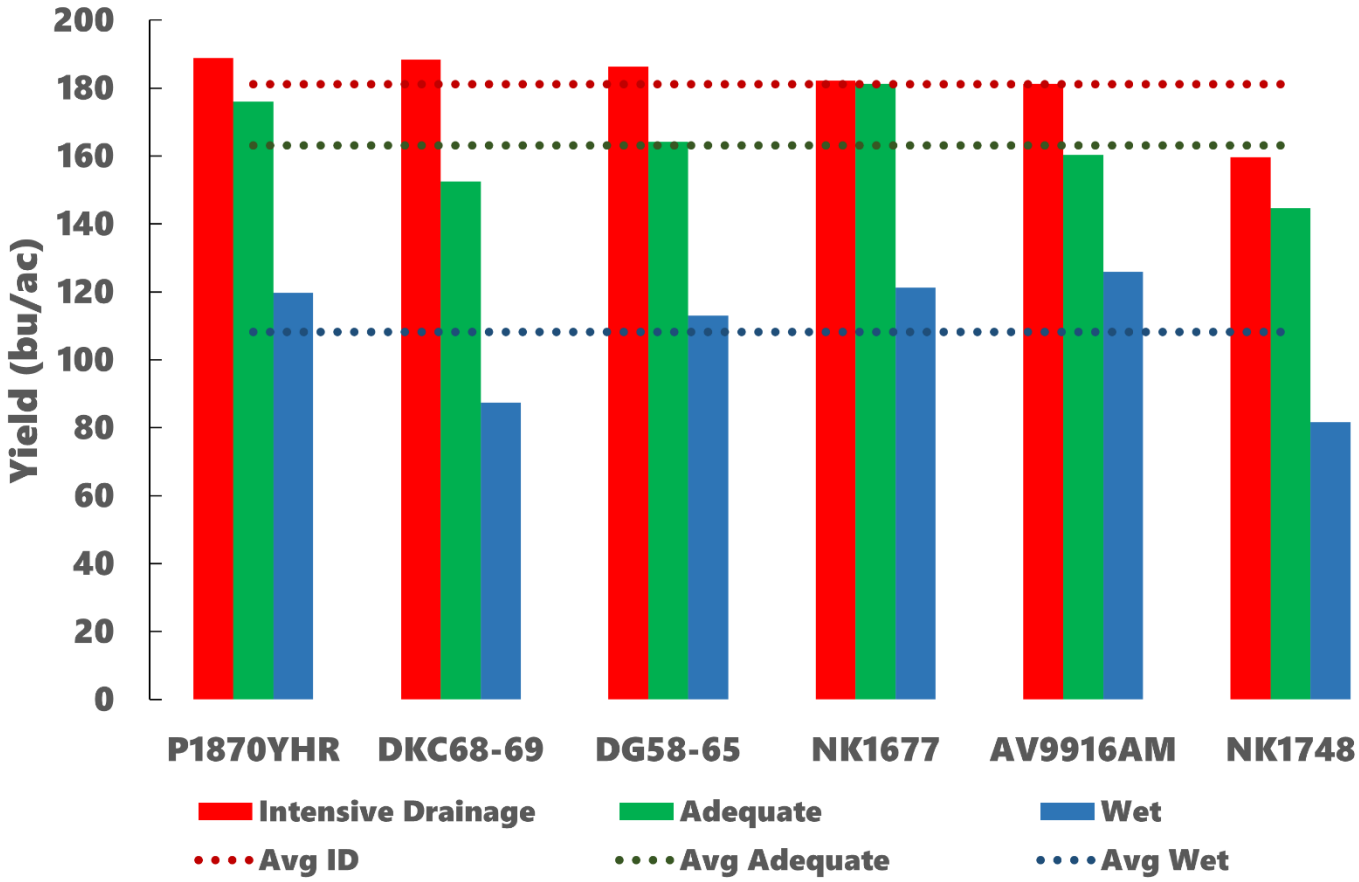
Overall

Full Season (≥116 RM) Hybrid
Performance Across Water Regimes

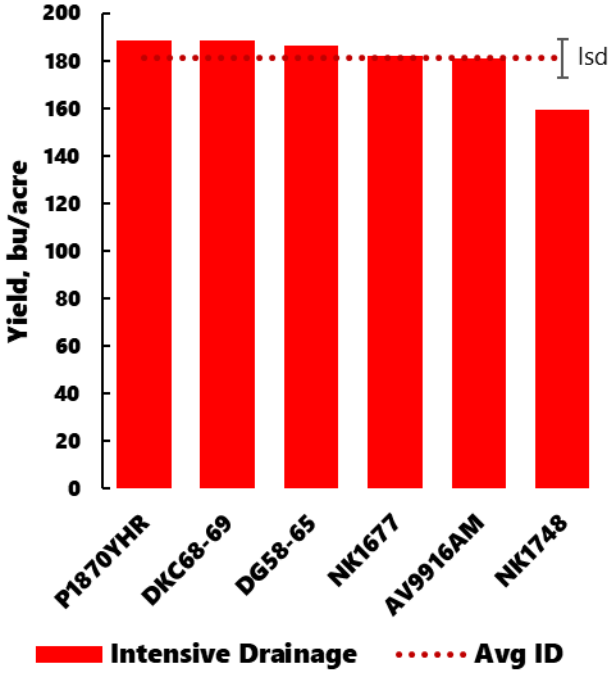
Company/Brand	*Entry*	*Yield, bu/acre*
NK Syngenta	1677	161.6
Pioneer	1870YHR	161.5
AgVenture	9916AM	155.9
Dyna-Gro	58-65	154.5
DeKalb	68-69	142.7
NK Syngenta	1748	128.6
	Mean	150.8
	CV	25.5
	$LSD_{0.05}$	12.2
	n	72
	***p*-Value**	<.0001

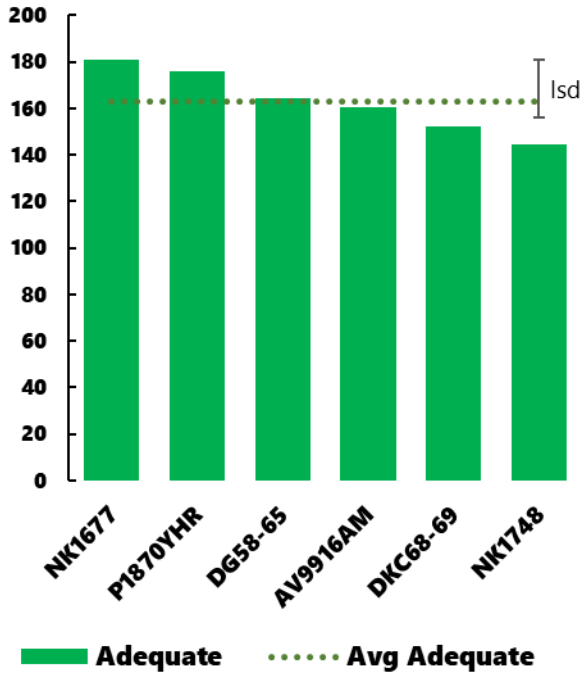
Entries highlighted in green are not different

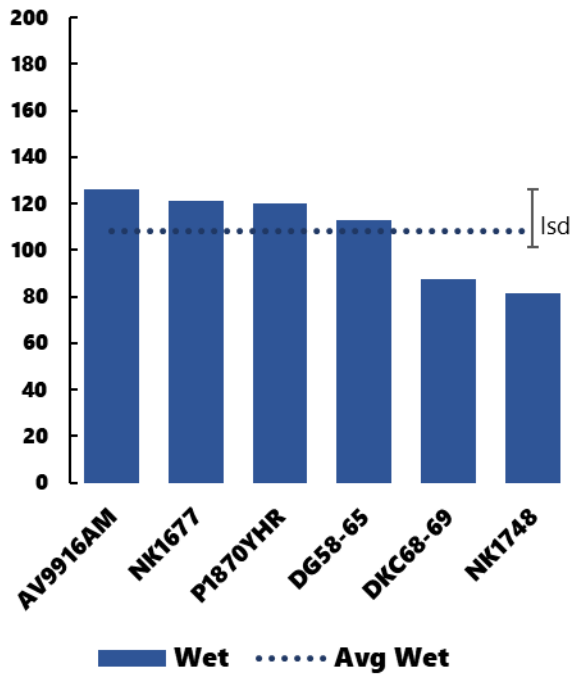
(≥116 RM) Corn Hybrid Yields Across Water Stress Environments 2021



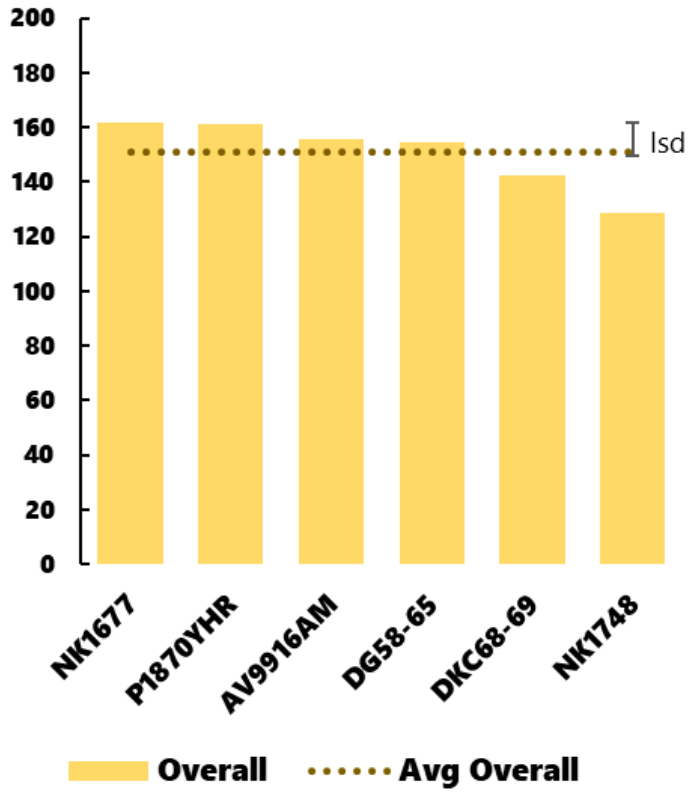
(≥116 RM) Corn Hybrid Yields Within Water Stress Environments 2021







(≥116 RM) Corn Hybrid Yields Overall



2021 Water Resiliency Corn Hybrid (110 - 115 RM) Water Stress Performance Trials, Plymouth, N.C.

Intensive Drainage

Medium Season (110-115 RM) Hybrid Performance

Rainfed, intensively tile drained @ 37.5' o.c.*

Company/Brand	*Entry*	*Yield, bu/acre*
Dyna-Gro	54-14	191.4
MorCorn	4255	185.6
AgVenture	2115	184.5
Pioneer	1506YHR	183.6
DeKalb	64-65	182.9
	Mean	185.6
	CV	6.8
	$LSD_{0.05}$	17.4
	n	20
	***p*-Value**	0.831

No significant differences between hybrids

*on-center

Adequate

Medium Season (110-115 RM) Hybrid Performance

Adequate moisture, tile drained @ 75' o.c.

Company/Brand	*Entry*	*Yield, bu/acre*
Pioneer	1506YHR	171.1
Dyna-Gro	54-14	166.1
AgVenture	2115	162.3
DeKalb	64-65	161.0
MorCorn	4255	141.6
	Mean	160.4
	CV	13.8
	$LSD_{0.05}$	n/s
	n	20
	***p*-Value**	0.242

No significant differences between hybrids

Wet Stress

Medium Season (110-115 RM) Hybrid Performance

Wet, tile undrained @ 37.5' o.c.

Company/Brand	*Entry*	*Yield, bu/acre*
MorCorn	4255	126.2
AgVenture	2115	125.0
DeKalb	64-65	120.8
Pioneer	1506YHR	116.9
Dyna-Gro	54-14	95.4
	Mean	116.9
	CV	20.5
	$LSD_{0.05}$	n/s
	n	20
	***p*-Value**	0.201

No significant differences between hybrids

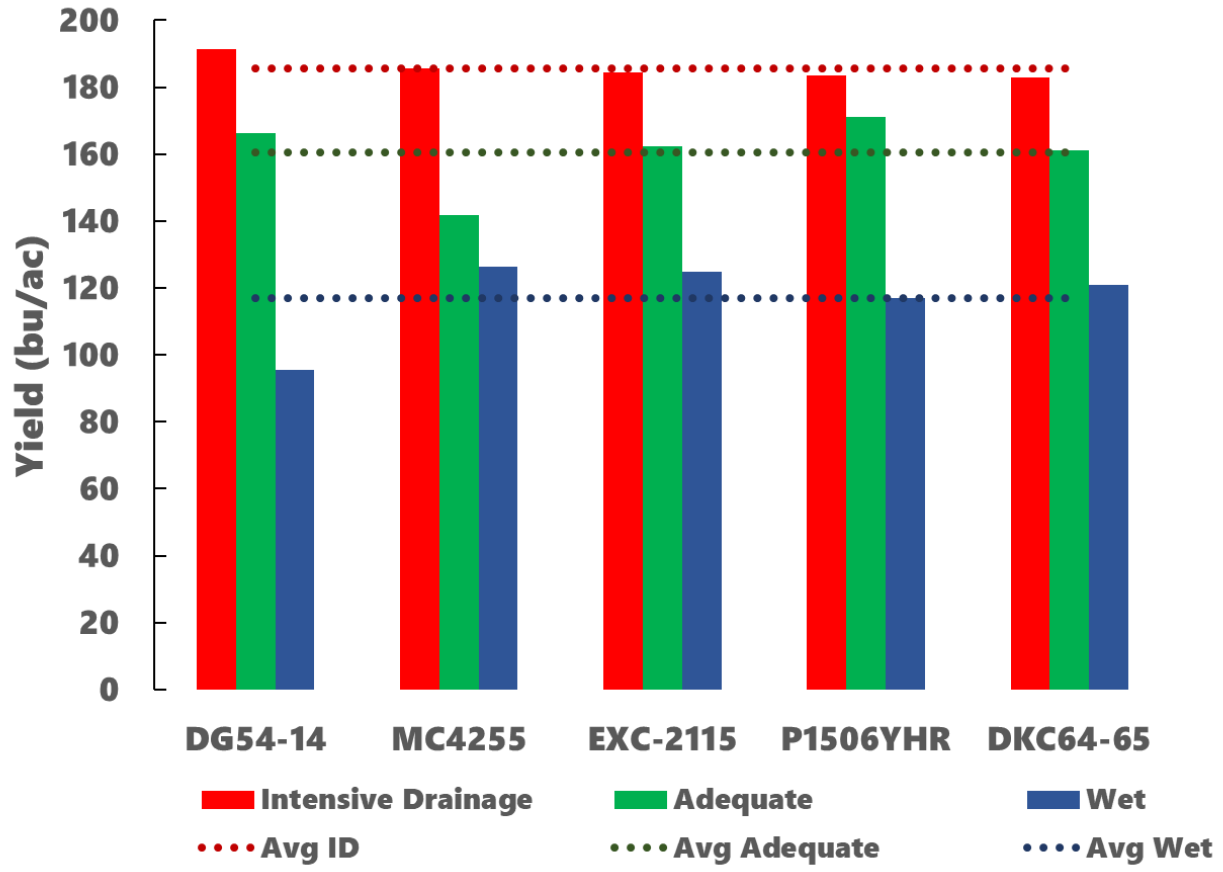
Overall

Medium Season (110-115 RM) Hybrid Performance Across Water Stress Regimes

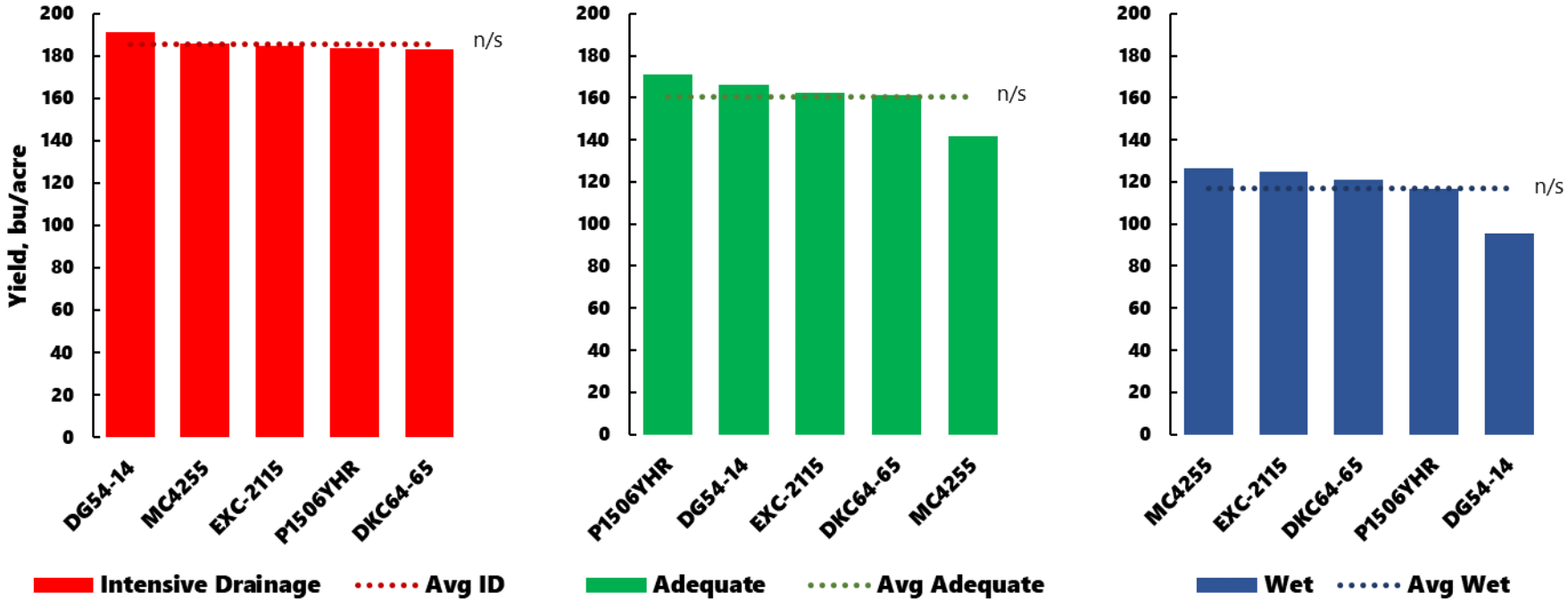
Company/Brand	*Entry*	*Yield, bu/acre*
AgVenture	2115	157.3
Pioneer	1506YHR	157.2
DeKalb	64-65	154.9
MorCorn	4255	151.6
Dyna-Gro	54-14	151.0
	Mean	154.2
	CV	22.6
	$LSD_{0.05}$	n/s
	n	60
	***p*-Value**	0.786

No significant difference between hybrids

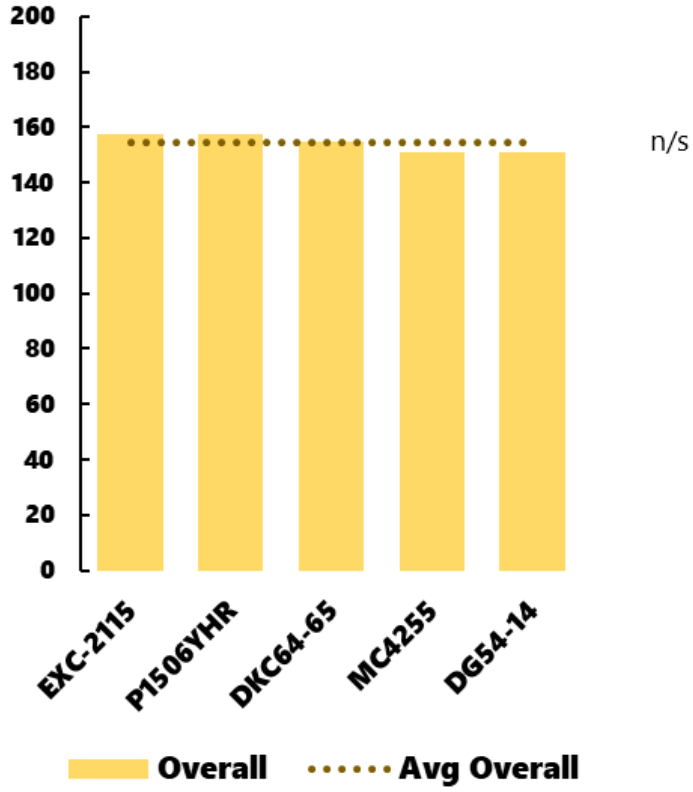
(110-115 RM) Corn Hybrid Yields Across Water Stress Environments 2021



(110-115 RM) Corn Hybrid Yields Within Water Stress Environments 2021



(110-115 RM) Corn Hybrid Yields Overall



n/s

2021 Water Resiliency Corn Hybrid (103 - 109 RM) Water Stress Performance Trials, Plymouth, N.C.

Intensive Drainage

Early Season (103-109 RM) Hybrid Performance

Rainfed, intensively tile drained @ 37.5' o.c.

Company/Brand	*Entry*	*Yield, bu/acre*
AgVenture	EXC-2110	187.5
DeKalb	DKC59-82	179.6
Pioneer	0339AM	143.8
	Mean	170.3
	CV	15.1
	$LSD_{0.05}$	11.2
	n	12
	***p*-Value**	0.0002

Entries highlighted in green are not different
*on-center

Adequate

Early Season (103-109 RM) Hybrid Performance

Adequate moisture, tile drained @ 75' o.c.

Company/Brand	*Entry*	*Yield, bu/acre*
DeKalb	59-82	160.7
AgVenture	2110	154.4
Pioneer	0339AM	142.4
	Mean	152.5
	CV	20.4
	$LSD_{0.05}$	n/s
	n	12
	***p*-Value**	0.229

No significant differences between hybrids

Wet Stress

Early Season (103-109 RM) Hybrid Performance

Wet, tile undrained @ 37.5' o.c.

Company/Brand	*Entry*	*Yield, bu/acre*
DeKalb	59-82	109.8
AgVenture	2110	96.8
Pioneer	0339AM	85.5
	Mean	97.4
	CV	29.4
	$LSD_{0.05}$	n/s
	n	12
	***p*-Value**	0.144

No significant differences between hybrids

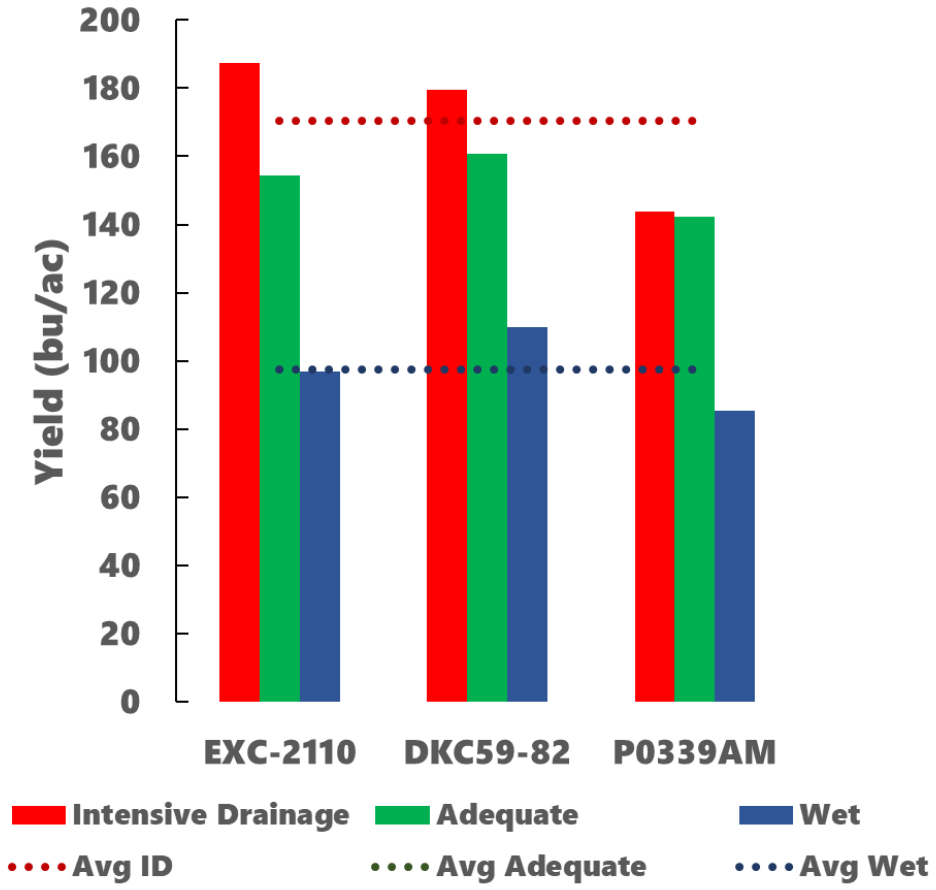
Overall

Early Season (103-109 RM) Hybrid Performance Across Water Stress Regimes

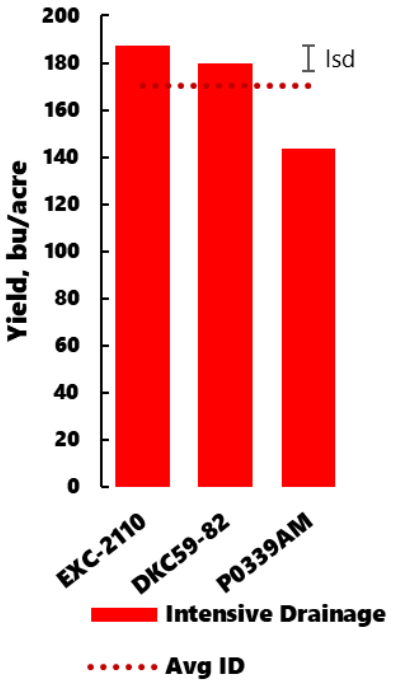
Company/Brand	*Entry*	*Yield, bu/acre*
DeKalb	59-82	150.0
AgVenture	2110	146.2
Pioneer	0339AM	123.9
	Mean	140.0
	CV	30.0
	$LSD_{0.05}$	10.4
	n	36
	***p*-Value**	<.0001

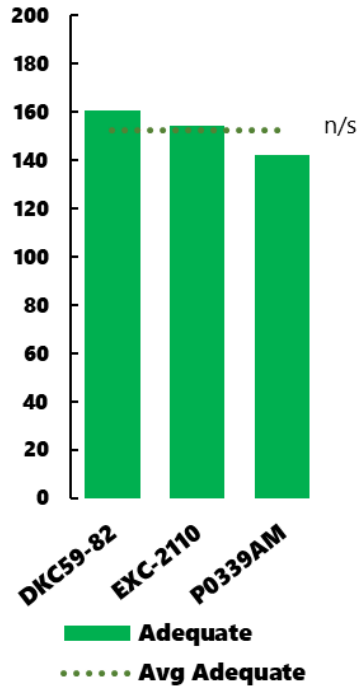
Entries highlighted in green are not different

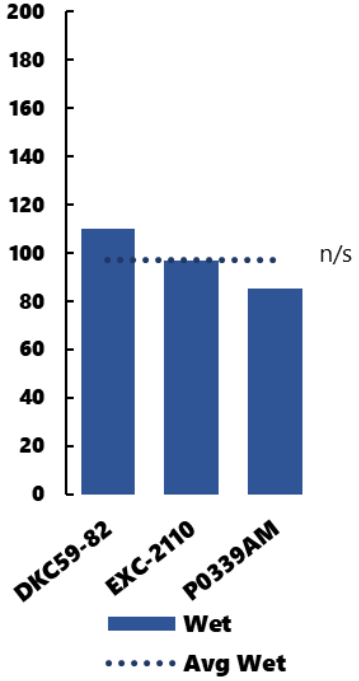
(103-109 RM) Corn Hybrid Yields Across Water Stress Environments 2021



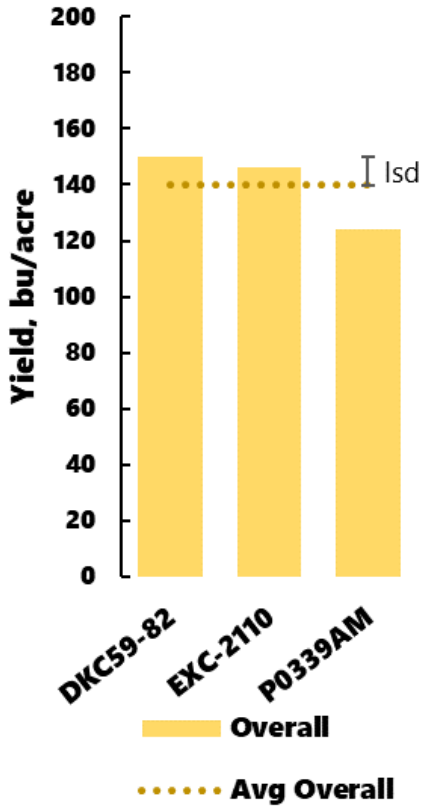
(103-109 RM) Corn Hybrid Yields Within Water Stress Environments 2021







(103-109 RM) Corn Hybrid Yields Overall



Acknowledgements

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