

**Effect of rate, timing and method of application of fulvic and humic acids to corn**

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## Effect of rate, timing and method of application of fulvic and humic acids to corn

Blacksburg, VA, 2016

Study conducted by:

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The following treatments were installed by applying with herbicide prior to planting (Burndown) at the time of corn planting in a starter band, 2 inches to the side and 2 inches below the seed (2\*2) , as a foliar application at V6-7, or with sidedress fertilizer at V6-7 at one location near Blacksburg, VA on a site mapped as Braddock and Unison loams soils 5.

TRT	Burndown	2*2	Foliar	Sidedress
1	UAN	UAN	WATER	UAN
2	UAN+HA 1 gal/ac	UAN+HA 1 quart/ac	Water+HA 2quarts /ac	UAN+HA 1 gal/ac
3	UAN+FA 13 gal/ac	UAN+FA 1 quart/ac	UAN+FA 2 quarts/ac	UAN+FA 1 gal/ac
4	UAN+FA 8 gal/ac	UAN+FA 1 quart/ac	UAN+FA 2 quarts/ac	UAN+FA 1 gal/ac
5	UAN+FA 4 gal/ac	UAN+FA 1 quart/ac	UAN+FA 2 quarts/ac	UAN+FA 1 gal/ac
6	UAN+FA 2 gal/ac	UAN+FA 1 quart/ac	UAN+FA 2 quarts/ac	UAN+FA 1 gal/ac
7	UAN+FA 1 gal/ac	UAN+FA 1 quart/ac	UAN+FA 2 quarts/ac	UAN+FA 1 gal/ac
8	90% UAN+FA 4 gal/ac	UAN+FA 1 quart/ac	UAN+FA 2 quarts/ac	UAN+FA 1 gal/ac
9	90% UAN+FA 8 gal/ac	UAN+FA 1 quart/ac	UAN+FA 2 quarts/ac	UAN+FA 1 gal/ac

UAN – 30% N liquid

HA – Monty’s Liquid Carbon® Humic Acid

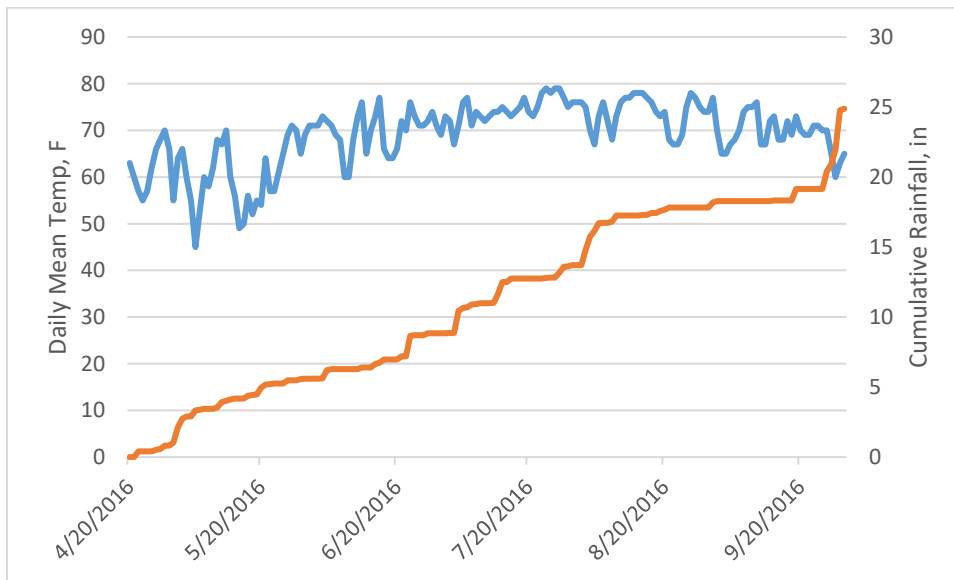
FA – Tranlin/Vastly Fulvic Acid, black liquor product (analysis not provided or performed)

The corn hybrid, Mid-Atlantic 8127RR was planted at 27,500 seeds/ac using a John Deere MaxEmerge planter on April 29, 2016. Burndown applications were applied using a CO2-powered backpack applicator through #32 orifice restrictor plates, to achieve a rate of 9.2 gal/ac of UAN, plus the desired rate HA or FA (dilution rates of 1.4, 0.87, 0.43, 0.22 and 0.11, UAN to FA for the 13, 8, 4, 2, and 1 gal/ac FA application rates). These treatments were applied in a broadcast application to the soil, prior to corn emergence. At planting applications (2\*2) were similarly applied at a rate of 10.7 gal/ac of UAN plus additives per treatment, with the CO2 applicator output lines attached to fertilizer tubes on shanks set to apply material two inches to the side and two inches below the seed (dilution rate of 0.023 FA to UAN application rate). Foliar applications were made with water when corn was at the V6-V7 stage using the CO2 backpack equipped with TeeJet XRT 80° fan nozzles(June 16). UAN rate was 10 lb N/ac, or 3.14 gal UAN/ac. Total application volume was 10 gal/ac, with water reach the desired volume (dilution rate of 0.05 UAN+water to FA application rate). Sidedress rates were applied using the CO2 backpack with orifice restrictors in place to produce 30.7 gal UAN/ac (dilution rate of 0.033 UAN to FA application rate). Sidedress treatments were dribbled in a surface band between rows using flexible drop tubes attached below the orifice plants. Plots were harvested using a Kincaid 8XP small plot combine equipped with a grain gauge system that measured plot weight, grain moisture and test weight on each sample.

Subsamples were collected from each plot and grain composition estimated via near infrared spectroscopy (FOSS XDS, Foss North America). The HA product was the commercially available Monty's Liquid Carbon® Humic Acid product (<http://www.montysplantfood.com/products/montys-liquid-carbon/>). The Tranlin/Vastly product was shipped from China. We received a black liquid product that was shipped in a poly bag inside a cardboard box. Upon receipt, some material had precipitated but returned to solution with agitation. Other than this, there were no issues with handling or applying the FA fertilizer material.

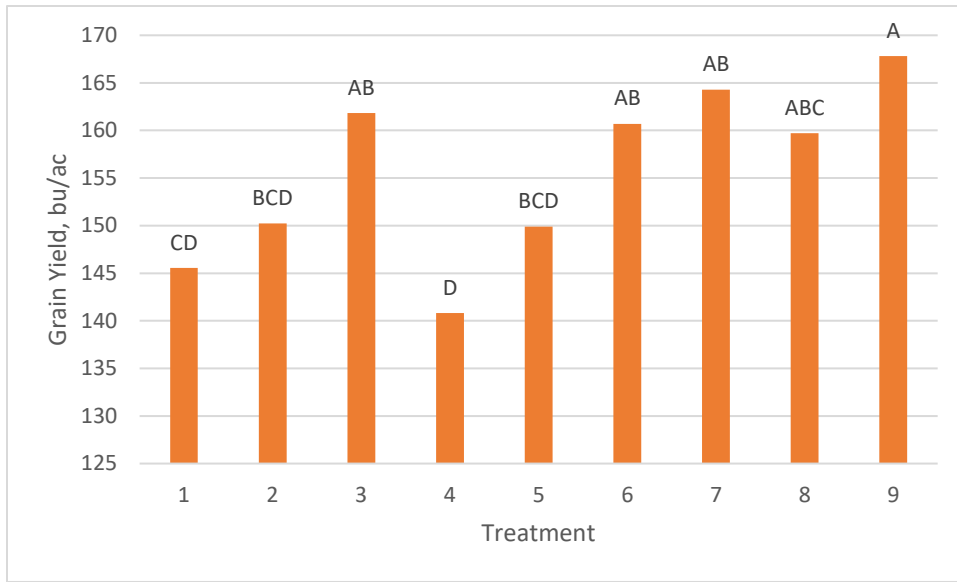
While conditions were generally favorable for corn growth and development at this site in 2016, May was cool and damp, resulting in slower than normal growth. There were dry periods of one week or more in both July and August and the July period coincided with hot day and nighttime temperatures. This period in July likely induced plant stress and likely reduced grain yields via kernel abortion.

Figure 1. Daily mean temperature and cumulative rainfall at Kentland Farm, 2016.



Treatments with the greatest grain yield were: nos. 3, 6, 7, 8 and 9 (Figure 2). These treatments included both where burndown UAN rate was decreased by 10, and FA was applied at either 4 or 8 gal/ac. Treatments six and seven were the lower rates of FA at burndown compared with the overall treatments. Yields of both the HA and FA treatments (trts 2 and 7) applied at 1 gal/ac were similar. Lowest yields occurred with UAN alone or FA applied at burndown at rates of 4 and 8 gal/ac.

Figure 2. Corn grain yields as affected by treatment at Kentland Farm, 2016.



Treatments did not affect grain moisture at harvest or grain test weight (Table 1). Other grain compositional constituents were generally affected by treatment but not consistently. Grain protein and starch were negatively correlated, as would be expected. But despite the fact that there are significant differences, it's unlikely that this variation is biologically meaningful.

Table 1. Grain yield moisture, test weight and grain composition, Kentland Farm, 2016.

	Grain Yield	Grain Moisture	Grain Test Weight	Grain Ash	Grain Fiber	Grain Fat	Grain Protein	Grain Starch
	bu/ac @	%	lb/bu			%		
Trt	15.5%							
1	145.5	18.9	57.1	2.5	2.9	4.3	10.0	59.7
2	150.2	19.1	57.5	2.5	2.8	4.2	9.3	60.0
3	161.8	19.0	57.4	2.4	2.1	3.9	9.6	59.9
4	140.8	18.1	57.2	2.4	2.6	4.2	10.0	60.2
5	149.9	18.2	56.9	2.5	2.6	4.2	9.7	60.3
6	160.7	18.7	56.2	2.5	2.3	4.1	9.6	60.0
7	164.3	18.2	56.7	2.5	2.5	4.3	10.2	60.3
8	159.7	19.0	57.4	2.6	2.5	4.3	9.3	59.7
9	167.8	18.8	57.5	2.6	2.5	4.3	9.4	60.0
LSD (0.10)	14.7	ns	ns	0.2	0.5	0.4	0.5	0.8

Overall, it appears that best results will be obtained with lower rates of HA and FA when applied with the full UAN rate at burndown, or with higher FA rates when applied with reduced UAN rates at burndown.

The suspected explanation for higher yields observed for some treatments with FA is a nitrogen response. We have no biological explanation for the lack of response in treatment four. By-replication data were consistent (no outliers) and no deficiencies in plant stand or vigor were noted in these plots. We observed no crop injury or negative effect from the application of any of the treatments/products.

**Blacksburg Whitethorne Farm**

**Planted:** 29-Apr-16

**Harvested:** 27-Sep-16

**Population:** 27,500 plants/ac

**Hybrid:** Mid-Atlantic 8127RR

**Pesticide:** 2 qt Gly-4 Plus® + .75 lb Atrazine 90 + 1 lb Simazine 90DF + 1 oz Python® + 2 qt Bicep II  
Magnum®preplant

5 lb Force® 3G at planting; 0.75 qt Atrazine 90+ 1 qt glyphosate June 15, 2015

**Fertilizer:** 40-40-40 granular blend preplant

**Plot Size:** 4 rows 25' x 30" 4 replications

**Soil Type:** Braddock and Unison, loam

**Previous crop:** Corn, barley cover crop

**Treatment application date:**

**Burndown** 25-Apr-16

**2 X 2** 29-Apr-16

**Sidedress** 16-Jun-16

**Foliar** 16-Jun-16