FOLIAR NITROGEN APPLICATIONS WITH FULVIC ACID RESULTS - 2021

Treatment Descriptions

Fulvic Acid Treatment Applications on Field Pea

	Treatment	Applications: Soil Applied 13-33-0-15S	Applications: Foliar Fulvic Acid at 6th node and 12th node stages
1	Control	120 lb ac^{-1}	-
2	Foliar Fulvic Acid	120 lb ac^{-1}	0.65 L ac^{-1}

Nitrogen and Fulvic Acid Treatment Applications on Canola

		Applications				
		At Seeding		Foliar at GS 15 and GS 61		
	Treatment	Dry Urea (46-0-0-0)	Fulvic Acid Treatment	Liquid Urea (18-0-0-0)	Nitro 18 (18-0-0 3Ca 1Mg)	Fulvic Acid
1	Control (Dry Urea)	175 lb ac^{-1}	-	-	-	-
2	Dry Urea + Fulvic Acid	175 lb ac^{-1}	0.3 L	-	-	-
3	Dry Urea; Liquid Urea	105 lb ac^{-1}	-	20 L ac^{-1}	-	-
4	Dry Urea + Fulvic Acid; Liquid Urea + Fulvic Acid	105 lb ac^{-1}	0.3 L	20 L ac^{-1}	-	0.65 L ac^{-1}
5	Dry Urea + Fulvic Acid; Liquid Nitro 18 + Fulvic Acid	105 lb ac^{-1}	0.3 L	-	20 L ac^{-1}	0.65 L ac^{-1}

Nitrogen and Fulvic Acid Treatments Applications on Spring Wheat

		Applications				
		At Seeding		Foliar at Zadok 21 and Zadok 57		
	Treatment	Dry Urea (46-0-0-0)	Fulvic Acid Treatment	Liquid Urea (18-0-0-0)	Nitro 18 (18-0-0 3Ca 1Mg)	Fulvic Acid
1	Control (Dry Urea)	150 lb ac^{-1}	-	-	-	-
2	Dry Urea + Fulvic Acid	150 lb ac^{-1}	0.3 L	-	-	-
3	Dry Urea; Liquid Urea	80 lb ac^{-1}	-	20 L ac^{-1}	-	-
4	Dry Urea + Fulvic Acid; Liquid Urea + Fulvic Acid	80 lb ac^{-1}	0.3 L	20 L ac^{-1}	-	0.65 L ac^{-1}
5	Dry Urea + Fulvic Acid; Liquid Nitro 18 + Fulvic Acid	80 lb ac^{-1}	0.3 L	-	20 L ac^{-1}	0.65 L ac^{-1}

Most of the soil organic matter is composed of humic substances (Nardi et al. 2002). Humic substances nurture plant cell membrane functions and encourage nutrient uptake. In the past ten years, there has been a growing body of evidence supporting the use of bio-stimulants in agriculture for both horticultural and field crop production systems, where they have been shown to increase root growth, enhanced nutrient uptake, and increase stress tolerance. du Jardin (2015) defined plant bio-stimulants in five categories: 1) microbial inoculants, 2) humic acids, 3) fulvic acids, 4) protein hydrolysates, and 5) amino acids, and seaweed extracts.

Fulvic acid, is of particular interest, as it is a natural chelator and thus helps facilitate migration of metal ions and nutrients across tissue membranes (Sun et al, 2012). It also retains many properties that make it ideal for foliar tank mixes, such as: (a) high solubility under different pH conditions (b) high cation exchange capacity, and (c) recorded absence of antagonistic effects with nutrients or pesticides. Owing to its low molecular weight (a few hundred Daltons), it can easily cross plant tissue membranes, and remains in solution even at high salt concentrations. All of which are considered ideal for foliar nutrient applications.

At the North Peace Applied Research Association, an experiment was designed to determine if foliar applications of Nitrogen with or without additions of fulvic acid have an effect on yield and leaf nitrogen content in canola, field pea and wheat. For field pea, only one treatment was conducted where foliar application of fulvic acid at 0.65 L ac-1 was applied at the 6th node and at the 12th node stage. This treatment was compared against a control where peas were sown in furrow with 13-33-0-15S at 120 lb ac-1. Above ground biomass was collected one week after foliar applications on each crop. For canola and wheat, the experiment was designed as a complete randomized block design with four treatments: (1) Dry urea at 150-175 lb ac-1 treated with fulvic acid at 0.3 L ac-1 applied at seeding, (2) Dry urea at seeding at 80-105 lb ac-1 followed by two foliar applications of liquid urea at 20 L ac-1, (3) Dry urea at 80-105 lb ac-1 treated with fulvic acid at 0.3 L ac-1 at seeding and two foliar applications of liquid urea with fulvic acid at 20 L ac-1 and 0.65 L ac-1, respectively and (4) seeding application of dry urea at 80-105 lb ac-1 treated with fulvic acid at 0.3 L ac-1 followed by two foliar applications of fulvic acid with a nitrogen, calcium and magnesium supplement (Nitro 18) at 0.65 L ac-1 and 20 L ac-1, respectively. In addition, a control treatment was included consisting of a sole application of dry urea at seeding at 150-175 lb ac-1.

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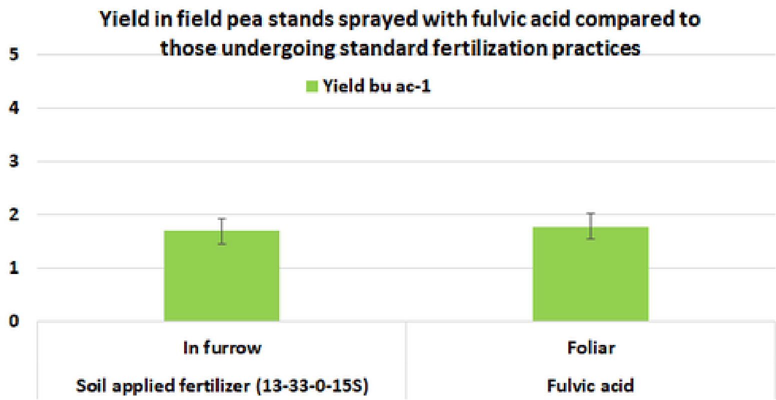
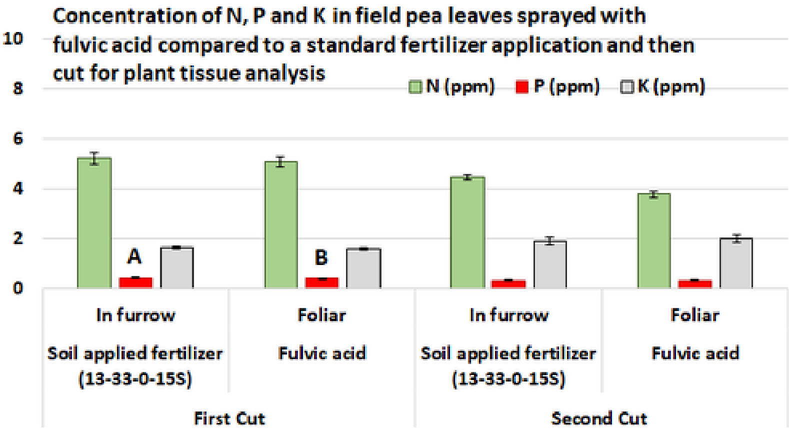
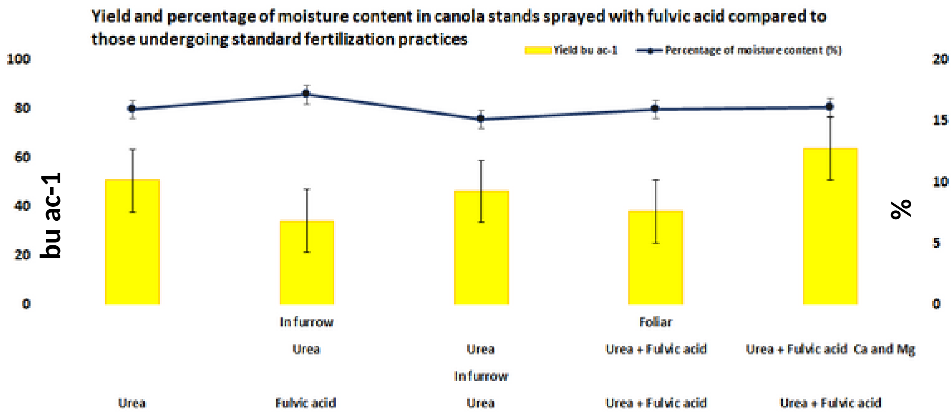
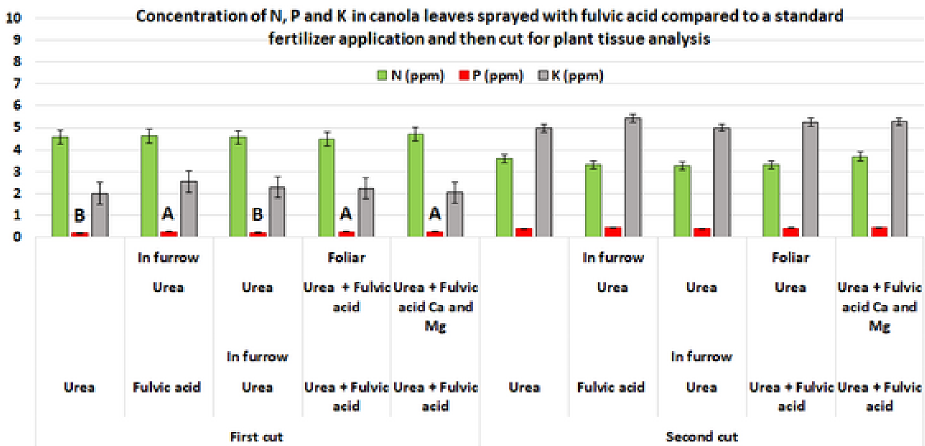




Field pea individuals showed no differences in yield (P=0.8338) or emergence (P=0.8387) across treatments compared to the control. This makes sense as most of the nitrogen uptake in legumes, such as field pea, occurs through biological fixation. Foliar application of fulvic acid may thus have less impact compared to soil applications of fertilizer. Like canola, phosphorus content from the first cut of above ground biomass, was greater in stands sown with a standard fertilizer treatment compared to those that underwent foliar fulvic acid applications (P=0.0335). No difference was found by the second cut (P=0.9036). Nitrogen and Potassium content were the same regardless of the cut and the treatment (P=0.5993 and 0.1501 for N and P=0.2095 and 0.6915 for K, respectively). The increase in P in canola and field pea in the first cut may have been a response to drought stress and extensive heat experience during the summer.



Canola showed no difference between foliar and in furrow applications compared to the control for moisture (P=0.4916) and yield (P=0.5285). Nitrogen and Potassium content did not vary among treatments in either the first or second cut (P= 0.9882 and 0.4156 for N and P=0.7030 and 0.1744 for K, respectively). Phosphorus content as low as the control in canola plants sprayed and sown with urea compared to those exposed to fulvic acid in the first cut (P=0.0072). However, there was no difference in the second cut of plant tissue samples (P=0.5056).



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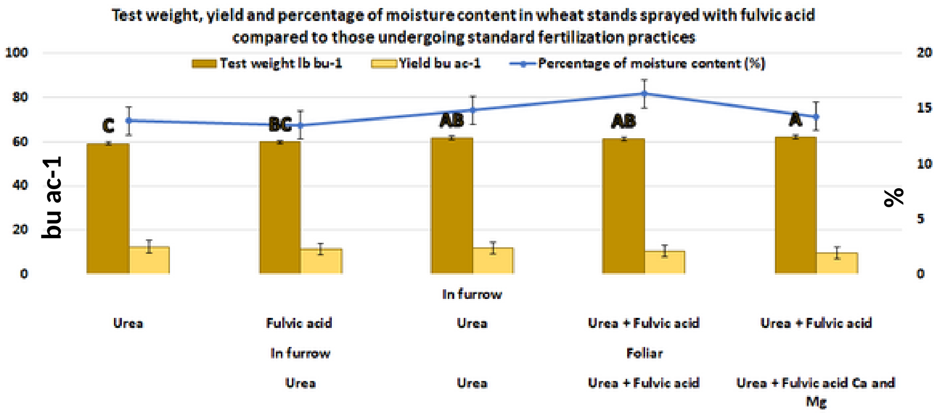
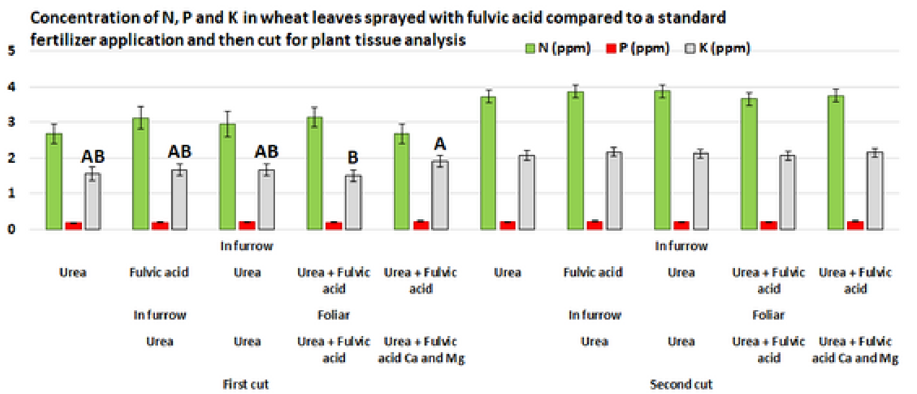
In wheat, moisture content (P=0.5872) and yield (P=0.7871) were the same across all application treatments. Test weight, on the other hand, was greater in plants sprayed with fulvic acid with Nitro 18 (N, Ca and Mg supplements) compared to the control (P=0.0403). Test weights were the same in wheat stands where urea was applied at seeding and foliar and in stands where foliar and in furrow applications of urea and fulvic acid tank mixes were conducted. It is possible greater weight per volume was achieved due to foliar applications of fulvic acid, as fulvic acid may have encouraged nutrient storage in the grains. N, P and K content in the first and second above ground biomass cut were the same in all treatment applications (P= 0.4842 and 0.8323,0.2832 and 0.8102, and 0.2621 and 0.9171 for N, P and K, respectively).





Seeding, Maintenance, and Harvest Information

Foliar nitrogen applications with fulvic acid (Spring Wheat, Canola, and Field Pea) - Seeding, Maintenance, and Harvest Information*

Seeding**		Maintenance						Harvest***
		Fertilizer		Herbicide		Insecticide		
Date	Depth	Date	Product	Date	Product	Date	Product	Date
Spring Wheat (AAC Brandon at 30 plants ft⁻²)								
Jun. 7	1 in.	Jun. 7	Treated 46-0-0-0	May 16	RT 540 (0.66 L ac^{-1})	Jun. 29	Coragen (0.101 L ac^{-1})	Oct. 2
			(variable as per treatment,	Jun. 23	Fluroxypyr (0.32 L ac^{-1})	Jul. 14	Coragen (0.101 L ac^{-1})	
			Banded between rows;	Jun. 23	Clopyralid (0.11 L ac^{-1})			
			liquid lime in furrow)	Jun. 23	MCPA (0.365 L ac^{-1})			
		Jul. 6	1st foliar treatment applied	Sep. 23	Roundup Transorb HC (1 L ac^{-1})			
		Jul. 21	2nd foliar treatment applied					
Canola (CS 2600 at 10 plants ft^{-2})								
May 24	0.25 in.	May 24	13-33-0-15S (100 lb ac^{-1})	May 16	RT 540 (0.66 L ac^{-1})	Jun. 29	Coragen (0.101 L ac^{-1})	Oct. 14
		May 24	Treated 46-0-0-0	Jun. 21	Roundup Transorb HC (0.66 L ac^{-1})	Jul. 14	Coragen (0.101 L ac^{-1})	
			(variable as per treatment;	Jun. 28	Roundup Transorb HC (0.66 L ac^{-1})			
			banded between seed rows)	Oct. 1	Liberty 150 SN (1.4 L ac^{-1})			
		Jul. 6	1st foliar treatment applied					
		Jul. 21	2nd foliar treatment applied					
Field Pea (AAC Lacombe at 10 plants ft^{-2})								
May 13	1 in.	May 13	13-33-0-15S (120 lb ac^{-1})	May 16	RT 540 (0.66 L ac^{-1})	Jun. 29	Coragen (0.101 L ac^{-1})	Sep. 24
		Jun. 8	1st foliar treatment applied	Jun. 14	Viper ADV (0.404 L ac^{-1})	Jul. 14	Coragen (0.101 L ac^{-1})	
		Jul. 14	2nd foliar treatment applied	Jun. 14	28% UAN (0.8 L ac^{-1})			
				Sep. 7	Reglone Ion (0.86 L ac^{-1})			

* All treatments were set-up as a randomized complete block design (RCBD) with four replicates
** All plots seeded with Fabro no-till disc drill plot seeder equipped with planter-mounted coulters.
*** All plots harvested with Wintersteiger Nurserymaster Expert plot combine.
Note: Dates and treatments applicable to all trials referenced in each respective chart unless specified.