Spring Cereal Fertilization in a 2-Pass Direct Seed System

Steve and Ann Swannack, Producer
***with* Aaron Esser, WSU Extension**

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Objective:

The objective of this series of on-farm tests is to provide growers with useful information about high vs. low soil disturbance fertilizer application equipment in a 2-pass direct seeded spring cereal production system.

Study Location:

Location: About 5 miles northwest of Lamont, WA.
Annual precipitation: 12-13 inches.
Soil type: silt loam.

Treatments and Operations:

Two treatments comparing 'aqua' bulk nitrogen application were examined in a series of on-farm test over a 5 year period. The treatments are:

1. **Coulter**: uses a *low disturbance* coulter delivery system with high pressure nozzles to place the fertilizer in the bottom of the trench. Similar to a commercial "Blue Jet" applicator
2. **Shank**: uses a *high disturbance* shank fertilizer delivery system that is traditionally used for bulk fertilizer application.

The on-farm test sites were sprayed with glyphosate in the spring. Bulk fertilizer treatments were applied and then seeded with no additional tillage operations. The trial was seeded with International 150 hoe drills on 10-inch row spacing. The varieties and seeding rates varied each year because of markets and seeding conditions (Table 1). Fertilizer application rates were adjusted for soil residual nitrogen (soil tests) and desired end use grain quality. Bulk nitrogen application was applied with the two treatments and starter fertilizer was applied with the drill. The on-farm tests were

seeded into spring cereal residue 4 years and yellow mustard residue 1 year. The trial was a randomized complete block design with 4 replications each year. Plot size varied each year because of terrain, but overall they averaged ½ acre.

Table 1. Spring wheat variety, seeding rate and fertilizer rates applied with the drill and bulk fertilization treatments in an on-farm test at Steve and Ann Swannack's farm near Lamont, WA over a 5 year period.

Year	Variety	Seed rate (#/acre)	Fertilizer applied with the drill (#/acre)	Bulk Fertilizer applied (#/acre)
2001	'Alpowa'	80	10-0-0-0	50-0-0-10
2002	'ID 377S'	85	15-0-0-0	65-0-0-15
2003	ID 377 S	70	15-0-0-0	50-0-0-10
2004	'Tara'	80	-	70-0-0-10
2005	'Westbred 926'	85	20-8-0-0	60-0-0-15

Agronomic Results:

A high amount of variability was detected in spring wheat stand establishment and tiller production on ground fertilized with both high and low disturbance fertilizer applicator over the duration of this study. Overall there was no significant difference between treatments with an average of 12.6 plants/ft^2 and 2.8 tillers/ plant (Figure 1).

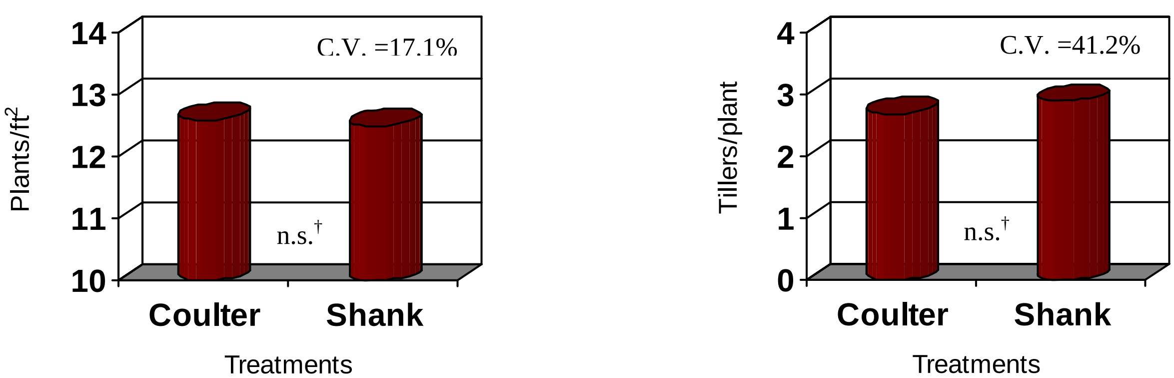


Figure 1. Stand establishment (left) and tillers (right) following fertilization with a high disturbance shank applicator and a low disturbance coulter applicator in an on-farm test at Steve and Ann Swannack's farm near Lamont, WA over a 5 year period.

† Level of Significance: **N.S.** treatment differences are not statistically significant.

Despite the lack of differences in stand establishment and tillers per plant, and a high amount of variability, grain yield was greater with the high disturbance shank applicator (Table 2). In each of the 5 years the average yield was greater following the shank applicator but in 4 of the 5 years the yield advantage was 1.6 bu/ac. In 2004 spring wheat fertilized with the shank treatment averaged 9-bu/acre higher yield than when it was fertilized with the coulter treatment. Over the five years spring wheat fertilized with the shank treatment averaged 29.0 bu/ace compared to only 26.0 bu/acre with the coulter treatments.

Table 2. Seed yield following fertilization with a high disturbance shank applicator and a low disturbance coulter applicator in an on-farm test at Steve and Ann Swannack's farm near Lamont, WA over a 5 year period.

	Year					
Treatments	2001	2002	2003	2004	2005	Mean
	---------------------------------------bu/ac --					
Shank	19.5	27.7	21.5	35.4	41.0	29.0
Coulter	16.8	26.8	20.2	26.4	39.7	26.0
Level of Sign.						0.001
CV						31.3%

High disturbance shank fertilizer applicator.

Low disturbance coulter fertilizer applicator.

Grain test weight was consistently greater with the low disturbance coulter fertilizer treatment over the 5-year period, averaging 59.1 lb/bu compared to only 58.3 lb/bu with the high disturbance shank applicator (Figure 2). Grain protein was consistently greater with the high disturbance shank fertilizer treatment over the 5-year period, averaging 13.6% compared to only 12.8% with the low disturbance coulter applicator.

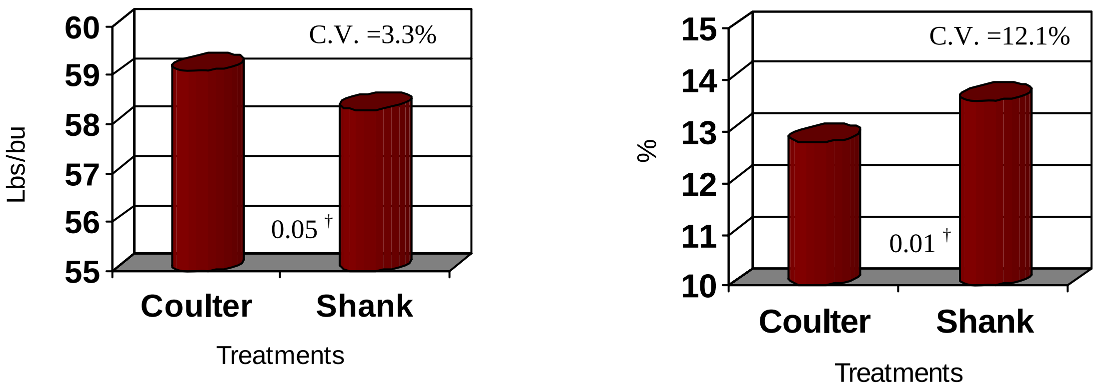
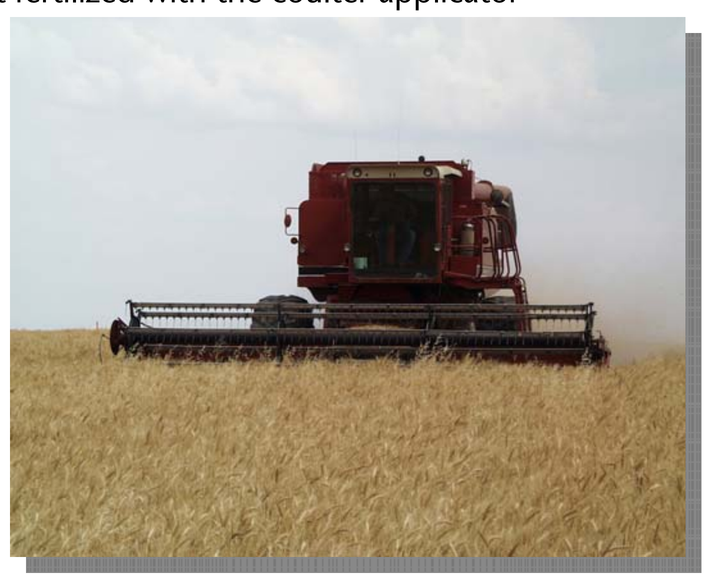


Figure 2. Grain test weight (left) and protein (right) following fertilization with a high disturbance shank applicator and a low disturbance coulter applicator in an on-farm test at Steve and Ann Swannack's farm near Lamont, WA over a 5 year period. C.V. = 3.3%.

† Level of Significance: **0.05** treatment differences are significant at the *P*<0.05.
0.01 treatment differences are significant at the *P*<0.01

Conclusions:

Coulter and shank fertilizer application in a 2-pass direct seed spring cereal grain production had no differing impact on stand establishment and tillers per plant over a 5 year period. However, during this period spring wheat fertilized with the coulter/low disturbance applicator produced an average of 10% lower yield, though this was variable among years. Spring wheat fertilized with the coulter applicator may have been under less moisture stress and expressed this as higher grain test weight and lower protein content, which maybe better suited for soft white spring wheat production. Spring wheat fertilized with the shank/high disturbance applicator treatment produced higher yields but may have been under greater late season moisture stress as evidenced by the lower grain test weight and higher protein content. Therefore the shank system may be better suited for higher protein spring wheat production such as hard white and DNS wheat.



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