

PROJECT TITLE: Evaluation of Seed Boot and Furrow Opener Configurations for Optimizing Seed and Fertilizer Placement in Simultaneous, Single-Pass Operations with Air Drills under Differing Cropping Systems.

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OBJECTIVES:

It is the objective of this project to evaluate air drill openers for the production of cereal grains under varying cropping conditions and systems in northern Montana.

RESULTS:

The agronomic performance of twelve “double-shoot” opener configurations under dryland chemical fallow conditions with ‘Scholar’ spring wheat direct-seeded into spring wheat stubble at Havre in 2001 is presented in Table 1. Yield performance data for all air drill opener trials conducted by NARC-Agronomy since the investigations began in 1997 is presented in Table 2.

SUMMARY:

Producers contemplating purchase of an air drill logically base their decisions on a number of variables to include manufacturer, dealer support, features, availability, price, etc. Prior to the past several years, limited attention was given the type and style of interchangeable openers supplied with a new or used air drill. In some situations, dealers want to encourage a prospective buyer to consider a particular type of opener thought to be most appropriate for the grower’s own conditions and needs, but are reluctant to do so if less sophisticated and less costly openers being selected on a competitor’s machine would result in loss of a sale. Due to the cost associated with outfitting a machine of average width with openers, producers prefer to limit their on-farm inventory to one or perhaps two differing scenarios to cover nearly all planting needs. Openers range widely in cost, but it is not uncommon for producers to spend an average of \$100 per shank which amounts to \$4000-\$5000 for a typical air drill. Thus, few producers can afford to make very many selection mistakes in a “trial and error” approach before finding the opener most appropriate for them. Approximately 70% of the dryland wheat and barley in major producing areas of Montana is sown with air drills. Thus, producers are keenly interested in unbiased evaluation of air drill opener options.

Our involvement with air drill opener investigations began in 1997 when Northern Agricultural Research Center hosted the third Montana “Fields of Tomorrow” show sponsored by Monsanto Company and KMON Country Radio with trade show support of numerous other vendors of agricultural supplies, equipment and technology. Part of NARC’s contract for hosting the show included on-site evaluation of air drill openers. The use of a research-scale ‘Concord’ air drill was provided to Northern Agricultural Research Center by the manufacturer in cooperation with area dealer, Northern Ag Services of Malta. At the same time, a research-scale ‘Conserva-Pak’ air drill was purchased by MSU for use in conducting a series of large-scale cropping systems projects in Montana funded by USDA’s Special Grant Program. Initially the MSU unit was available for inclusion in the opener evaluation studies at Havre and Moccasin. Heavy use schedules within the projects for which it was purchased have limited use of the Conserva-Pak in recent seed and fertilizer placement investigations. Carlson has conducted air drill opener investigations each year since 1997 with the Concord machine. Manufacturers and/or dealers provide all opener hardware at no cost to the Research Center.

The Concord unit is also integral to research investigations conducted by Stougaard and Carlson involving the use of widened seed bands and increased rates of seeding for reduction of wild oat competition in the production of spring wheat. Carlson, Long and Stougaard are further involved in developing other crop and crop pest management strategies utilizing Variable Rate Technology (VRT) equipment added to the Concord with funds provided in part by the

Montana Wheat and Barley Committee, Northern Agricultural Research Center and Northern Ag Services.

FUTURE PLANS:

The Research Center plans to continue work with opener evaluations in response to continued interest expressed by Montana producers. New opener configurations have been incorporated into the trials during each of the past three years, and mid-row fertilizer banding capability was added for the 2001 investigations.

Stougaard and Carlson completed the third of three years of field research in 2001 on the effects of seeding rate and placement patterns on spring wheat's ability to compete with wild oats.

Long, Carlson and Whitmus will further the investigations underway with VRT-equipped air drills in site-specific placement of nitrogen for optimized yield and protein relationships in wheat.

Thus, although originally put to work at Havre solely for the purpose of evaluating opener configurations – the Concord air drill is currently serving three separate, but related research endeavors out of the Havre station.

TABLE 1. Comparison of "Double-Shoot" Air Drill Opener Configurations on 12" Spacings under Dryland Chemical Fallow Conditions with 'Scholar' Spring Wheat Direct-Seeded into Spring Wheat Stubble at Havre. Northern Agricultural Research Center. Havre, Montana. 2001. (Exp# 01-SP08-OP)

1/ ENTRY	2/ SEED BAND Inches	3/ CULMS /FT ² No.	4/ HEAD DATE Julian	PLANT HEIGHT Inches	5/ GRAIN YIELD Bu/Ac	TEST WEIGHT Lbs/Bu	6/ GRAIN PROTEIN %
ATOM JET	3.5	27.7	183.0	20.1	31.1	62.1	17.2
DUTCH SUPER EAGLE w/3.5" Pr.Row Attach.	5.4	27.7	182.3	19.6	30.6	62.1	17.4
DUTCH SUPER EAGLE w/5.5" Pr.Row Attach.	6.8	28.3	183.3	19.2	28.8	62.1	17.4
FARMLAND LD w/Case-McKay 6"LD Swp.& K3	6.6	32.0	183.3	19.9	28.5	62.1	17.5
GEN T2x2	6.9	28.0	186.0	18.2	28.1	62.5	17.3
MORRIS Gumbo Boot	3.8	28.3	186.0	18.4	27.8	62.4	17.1
FLEXICOIL STEALTH w/Pair'd Row Attachment	4.1	26.7	183.3	19.1	27.5	62.3	17.5
FARMLAND SB1-SBS1 w/K3Knf.& 6"KO Swp.	6.2	28.7	185.3	18.2	27.4	62.4	17.4
FARMLAND SB1-SBS1 w/K3Knf.& 4"KO Swp.	4.5	27.0	185.7	18.7	27.4	62.5	17.4
DUTCH Sup'r.E.w/FarmLand Mid-Row Bnd'g Disks	2.9	27.0	184.7	19.2	27.2	62.3	16.8
ANDERSON (Case-Concord) Triple Shooter	4.9	25.7	186.0	17.4	26.6	62.1	17.0
FARMLAND LD w/Case-McKay11"LD Swp.& K3	7.1	28.0	184.0	18.7	26.4	62.3	17.4
EXPERIMENTAL MEANS	5.2	27.9	184.4	18.9	28.1	62.3	17.3
LSD (0.05)	1.1	7.2	1.0	1.4	4.9	0.5	0.6
C.V. 2: (S OF MEAN/MEAN)*100	7.4	8.8	0.2	2.6	6.0	0.3	1.2

1/ Seed was placed in marginal moisture at a uniform depth of 2.0 inches with a granular fertilizer blend banded at 251#/ac providing 70#N, 40#P₂O₅ and 25#K₂O. Square-wall, 6" 'Titan' packer tires were used with all openers in the trial.

2/ Average 'splayed' stubble width 4" above soil surface at harvest maturity

3/ Average no.of fertile culms (stems with filled heads) per linear foot (ft² on a 12-in. row spacing)

4/ No. of Days from January 1 (184 = July 3)

5/ Volumetric yields are based on 60 lbs/bu as the standard test weight for wheat.

6/ Protein values are adjusted to 12 percent grain moisture.

TABLE 2. ¹YIELD MEAN SUMMARY (Bu/Ac) FOR AIR DRILL OPENER INVESTIGATIONS CONDUCTED BY NORTHERN AGRICULTURAL RESEARCH CENTER - AGRONOMY (1997-2001)

(See Reports for Individual Investigations for Additional Performance Parameters, Site & Climatic Specifics, and Project Management Details)



² NO-TILL	CHEM+TILL	CHEM+TILL	² NO-TILL	² NO-TILL	² NO-TILL	NO-TILL	NO-TILL	NO-TILL
RECROP	FALLOW	FALLOW	FALLOW	RECROP	RECROP	FALLOW	FALLOW	FALLOW
SW-1997	WW-1998	SW-1998	WW-1998	WW-1998	WW-1998	SW-1999	SW-2000	SW-2001
(>BLY)	(>BLY)	(>BLY)	(>WW)	(>SW)	³ (>BLY)	(>BLY)	(>WW)	(>SW)
HAVRE	HAVRE	HAVRE	MOCCASIN	MOCCASIN	MOCCASIN	HAVRE	HAVRE	HAVRE

ANDERSON (Case-Concord) Triple Shooter	39.3	27.4	69.5	37.6	47.6	35.9	26.7	26.6
ATOM JET							27.9	31.1
CONCORD LD w/Case-McKay 6" LD Sweep & K3 Knife	38.1		75.8	44.6	66.3			
CONCORD LD w/Case-McKay 11" LD Sweep & K3 Knife	35.3		69.6	40.9	63.7			
CONSERVA PAK System	22.4	36.7	27.2	73.5	43.9	80.0		
DUTCH SUPER EAGLE w/3.5" Paired Row Attachment							38.9	30.8
DUTCH SUPER EAGLE w/5.5" Paired Row Attachment							37.8	28.2
DUTCH S.E. w/FARMLAND Mid Row Fertilizer Banding Disk								27.2
FARMLAND LD w/Case-McKay 6" LD Sweep & K3 Knife			28.2				38.7	25.6
FARMLAND LD w/Case-McKay 11" LD Sweep & K3 Knife			25.9				38.6	23.6
FARMLAND SB1-SBS1 w/3" Knock-On Spoon & K3 Knife	35.4	21.2	70.6	37.1	46.6			
FARMLAND SB1-SBS1 w/4" Chrome Sweep & K3 Knife	19.5		75.1	47.6	64.2			
FARMLAND SB1-SBS1 w/4" Knock-On Sweep & K3 Knife	40.0	25.6	74.5	47.1	62.8	35.4	26.6	27.4
FARMLAND SB1-SBS1 w/6" Knock-On Sweep & K3 Knife	23.9	41.0	24.0	70.3	48.1	58.9	35.7	28.1
FARMLAND SB1-SBS1 w/10" Knock-On Sweep & K3 Knife			23.5				35.2	
FLEXICOIL STEALTH w/Single Side Band Attachment	23.5	42.2	25.3	65.9	39.7	48.1	30.7	
FLEXICOIL STEALTH w/Paired Row Attachment	23.4	31.2	25.7	68.6	36.5	46.2	27.8	27.9
GEN T2	23.4							
GEN T2x2		41.1	26.3	71.9	45.7	58.5	37.0	27.1
MORRIS Gumbo Boot								24.3
SWEDE	22.5	36.8		63.8	42.0	60.9		26.3
SITE MEANS	22.4	37.9	25.5	71.0	42.4	58.6	35.6	26.9
LSD (.05)	2.8	5.3	3.7	7.9	7.7		4.4	2.9

¹G.R. Carlson, Northern Agricultural Research Center, Havre - Moccasin trials conducted in cooperation with D.M. Wichman, Central Agricultural Research Center, Moccasin.

All openers are "double-shoot" configurations with seeding rate at 60#/ac and fertilizer at 70#N, 40#P₂O₅, and 25#K₂O via blended granular fertilizer at 251#/ac.

²Trials conducted in conjunction with "Fields of Tomorrow" shows in 1997 and 1998.

³This trial had heavy volunteer barley pressure. Certain opener systems affording minimal surface soil disturbance produced higher wheat yields due to less competition with volunteer barley.