

Crop Cultivar Performance Testing Under Organic Management in Southwestern North Dakota

Patrick M. Carr, Timothy J. Winch, and Glenn B. Martin
North Dakota State University Dickinson Research Extension Center

SUMMARY

Small-grain and field pea cultivar performance testing was done in fields transitioning to certified organic management in 2009. Thirteen hard red spring wheat and six field pea cultivars were compared for grain yield and other selected traits in separate studies. The cultivar Howard produced 61 bu/acre and more grain than other cultivars in the spring wheat study, except for Coteau and Stoa. CDC Mozart averaged 43 bu/acre and more grain than Cruiser and Majoret in the field pea study. Seven emmer treatments representing different seed lots and cultivars were compared in a third field study. Grain yield averaged almost 3600 lb/acre with no difference detected across emmer treatment ($P > 0.05$). These results indicate that grain yield of hard red spring wheat, emmer, and field pea can exceed 40 bu/acre under dryland management when grown in fields transitioning to certified organic management in southwestern North Dakota.

INTRODUCTION

Cultivar adaptation studies are valued highly and encouraged by organic farmers and their proponents (Sooby et al., 2007). Previous research suggests that crop cultivars developed and selected in environments managed conventionally are adapted to environments managed organically (Carr et al., 2006), but recent studies indicate that cultivars suited to organic farming methods should be developed and selected under organic management (Mason et al., 2007; Murphy et al., 2007). Research is needed that identifies crop species and cultivars that are adapted to organic farming methods in North Dakota, as well as traits (e.g., rapid emergence; Sooby et al., 2007) that those species and cultivars possess which explain their adaptation to organic environments. Crop cultivar comparison efforts were established under organic management in a field transitioning to certified organic production in 2009 so that superior performing cultivars could be identified.

MATERIALS AND METHODS

The 2009 growing season began much later than is typical. As a result, small-grain and field pea cultivar comparison studies were not established until late May and not harvested until late August (field pea) or early September (emmer and spring wheat).

RESULTS AND DISCUSSION

The late seeding is reflected in the later-than-average first-flower (field pea) and heading (spring wheat)

dates that were observed (Tables 1 and 2). Date of first flower was similar among the six field pea cultivars that were compared. In contrast, differences occurred between spring wheat cultivars for heading date. 'Thatcher', 'Waldon', 'Glenn', and Howard were among the first cultivars to reach the heading growth stage, while 'Red Fife' and 'Vesta' were among the last. Lodging generally did not occur among spring wheat cultivars at physiological maturity, with the exception of Kota (lodging score = 4.5 on a scale of 0 to 9 where 0 = no lodging and 9 = completely flattened). In contrast, all emmer treatments had lodging scores greater than 5.0 (Table 3). Field pea lodging scores are not reported.

Field pea plant height ranged from 21 inches for Majoret to 27 inches for DS Admiral (Table 1). Differences between cultivars were not detected in the spring wheat study, with plant height averaging 35 inches (Table 2). Similarly, emmer plant height averaged 36 inches with no differences detected across treatments (Table 3).

CDC Mozart field pea produced a grain yield average of 43 bu/acre, compared with 37 bu/acre for Cruiser and 35 bu/acre for Majoret (Table 1). Both Cruiser and Majoret are green cotyledon-type field pea cultivars, whereas CDC Mozart is a yellow cotyledon-type field pea cultivar. However, CDC Striker is a green cotyledon-type pea cultivar that produced comparable amounts of grain (40 bu/acre) to that produced by CDC Mozart

Grain yield ranged from 61 bu/acre for Howard to 44 bu/acre for Thatcher in the spring wheat study (Table 2). Howard is a modern spring wheat cultivar developed and released by the Agricultural Experiment Station at North Dakota State University in 2006. Thatcher is an old spring wheat cultivar released in 1935. Coteau (released in 1978) and Stoa (released in 1984) still are grown on some organic farms, and both cultivars produced yield levels comparable to the grain yield produced by Howard. Glenn, released in 2005, was the most widely grown cultivar in North Dakota in 2009. Glenn produced an average grain yield of 55 bu/acre in the study. Other cultivars producing grain yield levels comparable to those produced by Glenn included Red Fife (widely grown in the late 19th century), Mida (released in 1944), Chris (released in 1965), Waldron (released in 1969), along with Coteau and Stoa. In contrast, the old cultivars Marquis

(released in 1910), Kota (released in 1921), Thatcher (released in 1935), and Vesta (released in 1942) produced less grain than either Glenn or Howard.

Emmer grain yield averaged 3574 lb/acre, with little variation across the seven treatments that were compared (Table 3). Similarly, differences were not detected between emmer treatments for any growth trait that was evaluated, as well as grain test weight.

Plans are underway to expand cultivar performance testing under organic management at the Dickinson Research Extension Center in 2010 and beyond. This research will aid farmers in selecting cultivars that are adapted to organic farming conditions in western parts of the state.

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Table 1. 2009 Organic field pea trial, NDSU Dickinson Research Extension Center¹

		Plant	First	Plant	Grain	Grain	Seed
	Cotelydon	population	flower	Height	yield	test weight	weight
Cultivar	type	- 1000/acre-	-July-	-in-	-bu/acre-	-lb/bu-	-g/100 seed-
CDC Golden	YELLOW	617	7	25	41	64.7	2067
CDC Mozart	YELLOW	585	6	20	43	64.5	1899
CDC Striker	GREEN	694	7	25	40	65.4	1832
Cruiser	GREEN	602	7	24	37	64.0	2272
DS Admiral	YELLOW	479	7	27	40	65.2	1866
Majoret	GREEN	536	7	21	35	63.8	2132
Mean		586	7	24	39	64.6	2,011
C.V. (%)		10	7	4	7	1	4
LSD (0.05)		84	NS	1.6	4	1	126

¹Planting date: 20 May; Harvest date: 25 August; Previous crop = Gazelle spring rye

Table 2. 2009 Organic hard red spring wheat trial, NDSU Dickinson Research Extension Center¹

	Approximate	Heading date	Lodging Score	Plant height	Grain yield
Cultivar	Year of Release	-July-	0-9	-in-	-bu/acre-
Red Fife	1885	16	0.3	33	51
Marquis	1910	15	0.8	37	49
Kota	1921	15	4.5	37	45
Thatcher	1935	10	0.3	35	44
Vesta	1942	16	3.8	33	47
Mida	1944	12	2.3	37	51
Acadia	1951	11	1.0	36	52
Chris	1965	13	1.3	34	51
Waldron	1969	10	0.0	35	51
Coteau	1978	15	0.0	35	57
Stoa	1984	11	0.3	35	56
Glenn	2005	10	0.0	35	55
Howard	2006	10	0.0	33	61
Mean		13	1.12	35	52
C.V. (%)		8	72	6	7
LSD (0.05)		1	1	NS	5

¹Planting date: 20 May; Harvest date: 02 September; Lodging: 0 = no lodging, 9 = completely flat; Previous crop = Gazelle spring rye

Table 3. 2009 Organic emmer trial, NDSU Dickinson Research Extension Center^{1,2}

	Days to heading	Plant height	Lodging score	Test weight	Grain yield
Cultivar	-d-	-in-	0-9	-lb/bu-	-lb/acre-
Bowman	60	36	5.8	34.4	3617.5
Common H	60	36	5.5	36.0	3639.1
Common M	60	36	5.3	33.8	3236.7
Common R	60	35	6.3	35.3	3599.5
Lucille	61	37	5.5	33.6	3607.4
Common ND	60	36	6.0	35.3	3691.1
Red Vernal	61	36	6.0	33.1	3629.6
Mean	60	36	5.8	34.5	3574.4
CV %	0.5	1.9	25.0	4.7	9.9
LSD (0.05)	0.4	NS	NS	NS	NS

¹Planting date: 20 May; Harvest date: 02 September; Lodging: 0 = no lodging, 9 = completely flat; Previous crop = Gazelle spring rye

²H, M, R, and ND refer to different seed lots of common emmer