

Hard Red Spring Wheat and Durum Wheat Production Guide (continued)

A-1050, May 1998

Variety Selection (continued)

NDSU Durum Variety Description

Variety	Agent or Origin ¹	Year Released	Chaff Color	Height	Straw Strength	Maturity
Ward	ND	1972	tan	tall	v.strg.	m.early
Rugby	ND	1973	tan	tall	v.strg.	m.early
Cando	ND	1975	tan	s.dwf.	v.strg.	med.
Vic	ND	1979	white	tall	med.	m.early
Lloyd	ND	1983	white	s.dwf.	v.strg.	med.
Medora	Can.	1983	white	tall	strg.	m.early
Kyle	Can.	1984	white	tall	weak	med.
Laker	WPB	1985	white	s.dwf.	strg.	med.
Monroe	ND	1985	white	tall	med.	early
Fjord	AgriPro	1986	white	tall	strg.	m.early
Renville	ND	1988	white	tall	med.	med.
Plenty	Can.	1990	white	tall	weak	late
Voss	AgriPro	1994	white	s.dwf.	v.strg.	med.
AC Melita	Can.	1995	white	tall	med.	med.
Munich	ND	1995	white	med.	v.strg.	med.
Ben	ND	1996	white	med.	strong	med.
Dressler	AgriPro	1996	white	tall	med.	med.

Belzar ND 1997 white tall med. Late

NDSU Durum Variety Description (continued)

Variety	Reaction to Disease ²				Quality Factors		
	Stem rust	Leaf rust	Foliar Disease	Hd Blight (Scab)	Test wt.	Kernel Size ³	Overall Quality ⁴
Ward	R	R	MR	S	avg.	med.	2
Rugby	R	R	MR	S*	avg.	med.	2
Cando	R	R	M	VS	avg.	small	2
Vic	R	R	MR	S*	high	large	4
Lloyd	R	MR	S	VS	avg.	med.	3
Medora	R	R	MS	VS	high	large	4
Kyle	R	MR	M	N/A	avg.	large	4
Laker	R	MR	S	S	avg.	med.	3
Monroe	R	R	M	VS	avg.	large	4
Fjord	R	R	M	S	high	large	4
Renville	R	R	M	S*	high	med.	4
Plenty	R	R	MR	MS	avg.	NA	4
Voss	R	MR	MS	S	avg.	med.	3
AC Melita	R	N/A	N/A	S	avg.	large	4
Munich	R	R	MR	S*	avg.	med.	4
Ben	R	R	MR	S*	high	large	4
Dressler	R	MR	N/A	VS	avg.	large	4
Belzar	R	R	MR	MR	low	large	4

¹ Refers to agent or developer: WPB = Western Plant Breeder.

² R = resistant; MR = moderately resistant (slow rusters); M = intermediate; MS = moderately susceptible; S = susceptible; VS = very susceptible; Foliar Disease = reaction to tan spot and septoria leaf spot complex. Letter ratings for head blight (scab) based on visual head symptoms. * Indicates yields and/or quality have often been higher than would be expected based on visual head blight symptoms done.

³ No. seeds/lb.: Large = less than 11,000; medium = 11,000-12,000; small = more than 12,000.

⁴ 1. Very poor quality;2. Poor quality;3. Average quality;4. Good quality. Quality assessment by the Department of Cereal Science, NDSU.

Fusarium head blight (scab) reactions of Durum Wheat in North Dakota.

Very Susceptible	Susceptible	Moderately Susceptible	Intermediate
Cando	AC Melita	Plenty	Belzer
Dressler	Ben*		
Lloyd	Fjord		
Medora	Laker		
Monroe	Munich*		
	Renville*		
	Rugby*		
	Vic*		
	Voss		
	Ward		

* Yield/quality tolerance to scab. These varieties have consistently shown less yield loss or less scabby kernels than expected based on the field symptoms.

Fungal Leaf Spot Reactions of Durum Wheat in North Dakota

Susceptible	Moderately Susceptible	Intermediate	Moderately Resistant
Laker	Medora	Cando	Belzer
Lloyd	Voss	Fjord	Ben
		Kyle	Munich
		Monroe	Plenty
		Renville	Rugby
			Vic
			Ward

VS = Very Susceptible; S = Susceptible; MS = Moderately Susceptible; M = Intermediate; MR = Moderately Resistant; Note: Above reactions are to tan spot and/or Septoria leaf spots. Leaf rust reactions of varieties may be different!

Planting Date

Plant as early as possible — as soon as a satisfactory seedbed can be prepared. Historically a 1% per day reduction in yield can be expected for each day planting is delayed after mid May. At a 50 bu/acre yield goal this is a half bushel per day. The main factor contributing to yield reduction due to delayed seeding is the potential of higher temperatures during the 4.0 to 5.5 leaf stage. This is the growth stage when the number of spikelets on the head is determined. The number of spikelets per spike decreases whenever the maximum day temperatures are above 63 F during this specific growth stage. In years when temperatures in June and early July do not exceed 80° F, yield reductions due to late planting will not be as great.

Planting Rate

Planting rate should be based on a desired final plant population. The following are needed to calculate the rate:

- Desired plant population at harvest.
- Estimated seedling mortality for your farm.*
- Percent germination of the seed lot to be used.
- Number of seeds per pound of the seed lot to be used.

* It is not uncommon for stand losses of 40% to occur on some early planted fields.

An example for calculating planting rate:

Desired population is 1,250,00 main stems at harvest.

Historic field stand loss is 10%.

Seed lot germination is 95%.

Wheat seed lot has a seed count of 14,300 seeds/lb.

$14,300 \text{ seeds/lb} \times 0.95 \text{ (\%viable seeds/lb)} = 13,585$

$1,250,000 \text{ seeds} \div 0.90 = 1,388,888 \text{ viable seed needed per acre.}$

$1,388,888 \text{ seeds} \div 13,585 \text{ viable seeds/lb} = 102 \text{ lbs per acre}$

Replanting Decisions

Replanting decisions are complicated by not knowing what future seasonal growing conditions will occur. Decisions should be based on historic trends plus current environmental and economic conditions. Questions that should be addressed when considering replanting include: Is there an economic advantage to replanting, should the same crop be replanted? The advisability of replanting must be carefully considered, keeping in mind that the cause and severity of injury, soil moisture, cost of replanting, previous herbicide use, and the date of replanting all influence whether a crop should be replanted or a different crop planted.

The cost of replanting must be recovered from a later maturing crop that typically has a lower yield potential than the original crop. Replanting also results in additional moisture loss.

While maximum wheat and durum yields are obtained at plant populations of 28 to 30 plants per square foot, acceptable yields can be achieved with populations of 8 to 14 plants per square foot. A uniform stand, even at very low densities, will often produce above expected yields. Generally only those fields with stands below 30% of intended plant densities or regions with 4 - 6 foot gaps should be considered for replanting.

Seeding Equipment Operation

The double disc press wheel drill used by many North Dakota growers provides best stands when traveling less than 4 mph and seeding less than 2 inches deep in a firm, high moisture seedbed. Faster speeds may cause extreme variation in seeding depths. Some newer air seeders and reduced tillage drills are designed to seed into high residue conditions. Some of these are hoe drills, air seeders, double disc drills, and single disc drills. Hoe drills move soil to place seed in a moist seedbed at ground speeds limited by soil movement and front rank covering. Air seeders using sweeps perform best in high moisture seedbeds and can operate at higher ground speeds than other units. Disc drills work best when residue is dry; when residue is wet, "hairpinning" of straw may occur. Seeding unit opener design dictates seedbed preparation and preseeding tillage needs.

Seeding unit settings and seed placement performance should be checked in each field. Performance should be checked frequently as seedbeds dry.

Packing soil over and around seed is essential for uniform emergence and becomes critical for rough, cloddy, rapidly drying seedbeds and late seedings. Reduced ground speeds enhance uniform seed covering and packing consistency.

Grain Drill Calibration

The seeding rate tables found in your operator's manual or on the drill hopper cover are based on a standard weight per bushel for various crops. Wheat has a standard weight of 60 pounds per bushel. Due to differences in varieties, the seed size and weight may vary from the standard.

Seed metering systems are based on volume displacement. Therefore, if one lot of seed varies in size and weight from another, two different amounts of seed will be metered if the drill setting is not changed. For this reason, metering systems should be calibrated for a seed size to plant a particular population per acre.

To determine the amount of seed to plant, a desired plant population at harvest time is needed. This has a major affect on yield. For maximum yield, across the entire state, a plant population of 1,250,000 plants per acre at harvest is desired. This is recommended in the western part of the state as well as the east, as main stem heads will yield better than heads on tillers.

To arrive at a particular plant population, an estimate of the field stand loss must be made. This can often be as low as 10% or as high as 40%. Often, a 10 to 20% loss occurs due to disease, weed competition, and seed damage during handling.

Usually not all seed grows. A germination test should be done on all seed so the amount planted can be increased to account for

this loss.

The pounds of seed to plant should be determined by a seed count. This is done as follows:

1. Count out 100 seeds (count out a larger amount if the scale is of marginal accuracy).
2. Weigh on a gram scale. (Some elevators or high school chemistry labs have gram scales. If you are near an NDSU Research Center, take your sample there and they can weigh it for you).
3. Calculate the seeds per pound. Example: 100 seeds weigh 3.17 grams

$$\frac{453.6 \text{ grams/lb}}{3.17 \text{ grams}} \times 100 \text{ seeds} = 14,309 \text{ seeds/lb}$$

NOTE: There are 453.6 grams/pound. By knowing the seeds in a pound, the seeds to plant or the pounds of seed to plant can be determined.

A simple way to check calibration is to count the number of seeds dropped in a square foot or linear foot of drill row. To do this:

1. Operate your drill on a firm soil surface at your normal operating speed. A slow speed will drop more seed than a faster speed.
2. Count the seeds dropped in one foot of drill row.
3. Multiply the single row seed count by the following drill row adjustment factor.

Drill Row Spacing	Adjustment Factor
(inches)	
6	2
7	1.7
8	1.5
10	1.2
12	1

4. Make several counts and compare the seeds counted to the values found in the following table. NOTE: The values listed in the adjoining table, Wheat Seeding Plant Population Per Square Foot, do not allow for reduced germination.
5. Make adjustments if necessary and repeat your calibration.

Wheat seeding plant populations per square foot*.

Seeding Rate	13,000 seeds/lb	15,000 seeds/lb	17,000 seeds/lb
(lbs/acre)	----- seeds/square foot -----		
		-	
60	18	20	23
70	21	24	27
80	24	27	31
90	27	31	35
100	30	34	39
110	33	38	43
120	36	41	47

* The numbers in the chart are based on seeds planted per square foot and does not consider stand reduction from less than 100 percent germination. Many times adjustment for seed size must be made. A large or small seed may require an adjustment different than listed in the table. Be sure to make this adjustment when making initial drill setting.

The most accurate method of determining seeding rate is to collect the seed metered from your drill over a measured distance.

The steps to follow are:

1. Measure out a distance for your drill width to equal 1/10 acre. This distance is listed in the following table.
2. Place bags under all drop tubes or place a tarp under a parked drill.
3. Operate the drill through the measured distance in the field at your normal operating speed. Or, if you prefer to do a stationary calibration, lift up the drill meter drive wheel, calculate the number of revolutions to cover 1/10 acre, engage the drill metering system and turn the drive wheel the number of revolutions to equal 1/10 acre for your drill width.

To calculate the number of revolutions for your drill drive wheel, multiply the diameter of the drive wheel in inches times 3.14. This gives you the distance around (circumference) your drive wheel in inches. Divide this number by 12 to give you the circumference in feet. Example: 21 inch drive wheel X 3.14 = 65.9 inches; 65.9 ÷ 12 = 5.5 feet.

4. Weigh the seed collected, multiply the weight by 10 as the amount collected was from 1/10 acre.
5. Compare this amount to your desired seeding rate. Make adjustments if necessary and repeat your calibration.

NOTE: This procedure can also be used to check the calibration of fertilizer applicators as well.

Drilling distance for 1/10 acre.

Drill Width	Distance
(feet)	(feet)
6	726
7	622
8	544
9	484
10	435
11	396
12	363
13	335
14	311

Sprayer Calibration

The procedure for calibrating a sprayer is not difficult. It is measuring the volume delivered by the sprayer to a part of an acre and then calculating how much would be delivered to an entire acre.

The first thing in any calibration procedure is to check the flow rate of all nozzles on the sprayer. All nozzles should discharge the same amount and produce a good pattern. This can be checked by collecting the flow from individual nozzles in a measuring cup for a period of time. Thirty seconds works well. Also, a sprayer calibrator works well. Any nozzles that are showing abnormal flow (either high or low) should be cleaned or replaced.

Several methods for calibrating sprayers are available. The following method is simple but accurate. Included is a chart listing the seconds to drive various distances converted to speed in miles per hour (MPH). This also allows you to check the accuracy of your tractor or pickup speedometer.

Sprayer Calibration Method

A sprayer can be calibrated by determining the time required for a sprayer to travel a measured distance and determining the

delivery rate of the nozzles during that time. The following chart lists the travel distance required for a single nozzle or group of nozzles spraying one row to spray 1/128 acre. When a nozzle treats 1/128 acre, one ounce of spray collected equals one gallon per acre.

Sprayer calibration chart.

Nozzle or Row Spacing	Travel Distance to equal 1/128 acre
(inches)	(feet)
40	102
30	136
22	185
20	204
10	408

Instructions for use:

1. Use the chart for distance to drive in the field (use nozzle spacing for broadcast sprayers or row spacing for directed and band rigs). For example: You want to broadcast spray with a unit that has a nozzle spacing of 20 inches. You need to measure off a distance of 204 feet in a field.
2. Set throttle for spraying and operate all equipment. Measure the seconds required to drive the measured distance. To check your travel speed in miles per hour, use Speed Calibration Chart.
3. Catch spray for the noted time in step 2 with a measuring cup. If a boom sprayer, catch spray from one nozzle for noted time. On directed spray rigs, catch spray from all nozzles per row for noted time.
4. Nozzle or nozzle group output in ounces = gallons/acre actually applied.
5. Repeat for each nozzle to assure uniform application.

Speed calibration chart.

	Distances Traveled (feet) During Various Time Periods (seconds)				
Speed	102	136	185	204	408
(MPH)	----- Seconds -----				

2.0	35	46	63	69	139
2.5	28	37	50	56	111
3.0	23	31	42	46	92
3.5	20	26	36	40	80
4.0	17	23	32	35	70
4.5	15	21	28	31	62
5.0	14	18	25	28	56
5.5	13	17	23	25	50
6.0	12	15	21	23	46
6.5	11	14	20	21	43
7.0	10	13	19	20	40
7.5	9	12	18	19	37
8.0	9	12	17	17	34
8.5	8	11	16	16	33
9.0	8	10	15	15	31
9.5	7	10	15	15	29
10.0	7	9	14	14	28

Example: If it takes 18 seconds to travel a distance of 136 feet, your travel speed is 5.0 MPH.

Drift reducing flat fan nozzles.

Manufacture Tip No.* (Nozzle Screen Size)	Liquid Pressure (PSI)	Capacity	
		Gal/Min (GPM)	Oz/Min (OPM)
Spraying Systems (100 mesh)	XR8001	15	7.7
	XR11001	20	9.0
		25	10.2
		30	11.5
		40	12.8
		50	14.1
		60	15.4
Spraying Systems	XR80015	15	11.7
	XR110015	20	14.1
		25	15.4
Delavan	80-1.5R	30	16.6

	100-1.5R			
		40	.15	19.2
		50	.17	21.8
(100 mesh)		60	.18	23.0

Spraying Systems	XR8002	15	.12	15.4
	XR11002	20	.14	17.9
		25	.16	20.5
Delavan	80-2R	30	.17	21.8
	110-2R			
		40	.20	25.6
(50 mesh)		50	.22	28.2
		60	.24	30.7

Spraying Systems	XR8003	15	.18	23.0
	XR11003	20	.21	26.8
		25	.24	30.7
Delavan	80-3R	30	.26	33.3
	110-3R			
		40	.30	38.4
(50 mesh)		50	.34	43.5
		60	.37	47.7

Spraying Systems	XR8004	15	.24	30.7
	XR11004	20	.28	35.8
		25	.32	41.0
Delavan	80-4R	30	.35	44.8
	110-4R			
		40	.40	51.2
(50 mesh)		50	.45	57.6
		60	.49	62.7

Spraying Systems	XR8005	15	.31	39.7
	XR11005	20	.35	44.8
		25	.40	51.2
Delavan	80-5R	30	.43	55.0
	110-5R			
		40	.50	64.0
(50 mesh)		50	.56	71.7
		60	.61	78.1

Spraying Systems	XR8006	15	.37	47.4
	XR11006	20	.42	53.8
		25	.47	60.2
Delavan	80-6R	30	.52	66.6
	110-6R			
		40	.60	76.8
(50 mesh)		50	.67	85.8
		60	.73	93.4

* Some nozzles may not interchange exactly among manufactures, however;
flow rate differences are usually small so interchanging should cause little problem.

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