Forage Performance of Cereal Cover Crops in Maryland

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2019-2020 Results

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Dairy farmers are constantly looking for sources of forage to meet their feed needs. One source that many of our region's dairy farmers utilize is the fall planting of cereal grains that are green-chop harvested the following spring. Among the cereal species used for this purpose are rye, triticale, barley, and wheat. Per the Maryland Cover Crop Program guidelines, cereal grains planted as a cover crop prior to November 5 and suppressed via green-chop in the spring are eligible for the grant payment for participation in the Cover Crop Program. In addition, per the Nutrient Management Regulations, a fall application of dairy manure is allowed to a field planted to a cereal cover crop.

Planting a cereal cover crop that will be green chop harvested fits well into the crop rotation used by many dairy farmers. The scenario that many follow is to plant the cereal cover crop following harvest of corn silage. Prior to planting the cover crop, an application of manure is made to the field. The subsequent planting of the cover crop provides incorporation of the manure into the soil. The fall and spring growth of the cover crop is supplied nutrients from the manure. At the same time, the cover crop provides protection to the soil from loss of nutrients via leaching and/or erosion. The objective of this study was to evaluate select varieties of cereal species for cover crop performance and forage production and quality.

Cereal varieties (21) representing four species (rye, triticale, wheat, barley) were evaluated at Central Maryland Research and Education Center – Clarksville Facility. Three replications for each entry were planted using a randomized complete block experimental design. Planting date was October 11, 2019. The 3' X 18' plots were planted with a small plot planter with 6-inch spacing between each of the 7 rows. The germination percentage for each entry was used to calculate the seeding rate needed to establish 1.5 million seedlings. Good stands were established in most plots by late fall.

Our goal each year is to time spring biomass harvest with when entries reach late boot to early heading stage of development. With the cool spring this year, plant growth and development slowed, with heading delayed until mid-May for most entries (Table 2) and harvest dates varying among the entries (listed in Table 1). Each harvest sample was collected by cutting the plants just above ground-level from three center rows of each plot from an area 2.5 feet in length and from two areas within the plot. The samples were placed into cloth bags and dried using a forced air dryer set at 60º C where they remained until sample water content was zero. Each sample was weighed and is reported as pounds of dry matter production per acre (Table 1). Each of the dried samples was ground through a 20-mesh screen using a large plant grinder and the ground biomass samples were sent to Cumberland Valley Analytical Laboratory for standard forage quality analysis.

Cover crop performance is measured by amount of biomass produced and the concentration of nitrogen (N) in the biomass. These two factors were used to estimate N uptake (Table 2). The cool weather this spring delayed harvest of this study, likely contributing to the higher biomass and N uptake observed this year compared to last year's trials. There was no significant difference in nitrogen uptake among the varieties tested. A number of forage quality characteristics for these cereals was measured (Table 2). The descriptions of the various quality characteristic are described here and in the footnotes at the bottom of Table 2. Crude protein (CP) is the N content of the forage, with higher protein representing better feed quality. This value was used to calculate nitrogen uptake of each variety (Nitrogen content = % CP/6.25). Both rye varieties and the barley check variety had significantly greater CP than the overall mean, with a number of triticale varieties having significantly less CP content than the overall mean. One rye and the barley variety also had rumen degradable protein (RDP) content significantly greater than the overall mean.

Neutral and acid detergent fiber (NDF, ADF) are measures of feed value and represent the less digestible components of the plant, with NDF representing total fiber and ADF representing the least digestible plant components. Low NDF and ADF values representing increased digestibility; ideally NDF values should be <50% and ADF values should be <35%. Values of both traits were above the ideal this year, as the late harvest resulted in more mature plants. Despite this, four triticale varieties (TriCal EXP 20T02, BCT 15509, BCT 18001, bCT 19005) had significantly lower NDF and ADF values than the overall mean, representing a digestible triticale varieties. This same variety also had significantly higher total digestible nutrients (TDN), net energy for lactation (NEL), relative feed value (RFV), and non-fiber carbohydrates (NFC), indicating good performing varieties.

The characteristic that best captures the overall forage quality performance is Relative Feed Value (RFV). A RFV of 100 is defined as the forage value that full bloom alfalfa would have. In addition to the triticale varieties mentioned previously, one additional triticale variety (TriCal Gainer 154) and the barley and wheat check varieties had RFV values significantly greater than the overall mean.

Though, none of these green-chop cereal forages are considered to be adequate as a stand-alone feed for a dairy operation, they can supply a source of forage used in a total mixed ration at the time of year when feed supply may be running short. When this forage benefit is added to the environmental benefit that is gained, planting winter cereal cover crops on a dairy farm can be a win-win decision.

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Table 1. Average harvest date for cereal species evaluated in Clarksville, MD in 2019-2020.

Variety	Species	Average harvest date
TriCal Exp 19R01	Rye	May 11
Rye VNS (check)	Rye	May 4
Mercer Brand Tri-Cow 814	Triticale	May 4
TriCal Gainer 154	Triticale	May 4
TriCal Flex 719	Triticale	May 13
TriCal Surge	Triticale	May 11
TriCal Merlin Max	Triticale	May 13
TriCal Thor	Triticale	May 13
TriCal Exp 20T02	Triticale	May 13
TriCal Exp 20T03	Triticale	May 13
TriCal Exp 20T04	Triticale	May 27
BCT 15509	Triticale	May 11
BCT 15513	Triticale	May 27
BCT 18001	Triticale	May 13
BCT 18002	Triticale	May 13
BCT 19003	Triticale	May 27
BCT 19004	Triticale	May 13
BCT 19005	Triticale	May 13
BCT 19006	Triticale	May 13
Nomini (check)	Barley	April 14
P25R25 (check)	Wheat	May 27

Table 2. Forage and cover crop performance of cereal species evaluated in Clarksville, MD during 2019-2020 growing season.

Variety	Species	Biomass Yield lb DM/a	Head Date	[1]Nitrogen Uptake lb N/a	[2]Crude Protein %	[3]Soluble Protein % DM	[4]RDP % DM	[5]ADF % DM	[6]NDF % DM	[7]Ash % DM	[8]Total Digestible Nutrients % DM	[9]Net Energy Lactation (Mcal/lb)	[10]RFV	[11]Non Fiber Carb. % DM
TriCal Exp 19R01	Rye	20655	April 17	395	11.9*	6.7*	9.3	41.8	64.0	7.4	56.5#	0.57#	82.0	15.2#
Rye VNS (check)	Rye	20490	May 3	351	10.7*	4.4	7.6*	42.5	65.6	7.4	57.2	0.58	79.2#	14.4#
Rye Mean		**20573**	**April 25**	**373**	**11.3***	**5.6**	**8.4**	**42.2**	**64.8**	**7.4**	**56.9**	**0.58**	**80.6**	**14.8**
Mercer Brand Tri-Cow 814	Triticale	23096	April 23	344	9.4	3.9	6.6	39.3	62.4	7.0	59.1	0.60	87.0	19.5
TriCal Gainer 154	Triticale	22925	May 4	260	9.5	3.9	6.7	37.4	59.5	6.6	60.3	0.61	96.5*	22.7
TriCal Flex 719	Triticale	24363	May 13	296	7.6#	2.8#	5.2#	42.7*	64.6	7.2	57.3	0.58	80.0#	19.2
TriCal Surge	Triticale	22601	May 13	312	8.5	3.0	5.8	40.8	62.0	7.7	58.2	0.59	85.5	20.1
TriCal Merlin Max	Triticale	22618	May 13	295	8.1	3.1#	5.6#	41.1	63.4	8.0	57.3	0.58	83.5	19.0
TriCal Thor	Triticale	27172	May 14	357	8.2	3.6	5.9	44.7*	65.3	7.8	55.7#	0.56#	78.0#	17.4
TriCal Exp 20T02	Triticale	23820	May 12	290	7.6#	2.5#	5.1#	34.5#	54.5#	7.0	62.9*	0.64*	106.0*	29.0*
TriCal Exp 20T03	Triticale	24867	May 13	341	8.6	3.0#	5.8	41.6	61.5	8.5*	57.9	0.59	85.3	19.8
TriCal Exp 20T04	Triticale	28459*	May 15	343	7.6#	4.0	5.8	48.7*	72.6*	7.4	52.7#	0.53#	65.3#	11.3#
BCT 15509	Triticale	22927	May 14	318	8.6	3.8	6.2	35.3#	56.9#	6.9	62.1*	0.63*	100.5*	25.7*
BCT 15513	Triticale	28316*	May 16	358	7.8#	5.0*	6.3	42.6	64.7	6.4	57.1	0.58	80.5#	19.8
BCT 18001	Triticale	25363	May 11	347	8.6	3.4	6.0	37.1#	56.7#	7.7	61.4*	0.63*	98.3*	25.1*
BCT 18002	Triticale	25654	May 12	318	7.8#	3.1#	5.4#	41.6	63.2	6.5	58.4	0.60	84.0	21.1
BCT 19003	Triticale	28526*	May 16	329	7.2#	3.8	5.5#	47.4*	70.2*	5.7#	64.2*	0.55#	69.0	15.9#
BCT 19004	Triticale	28740*	May 13	366	7.9#	2.8#	5.4#	41.3	62.2	7.0	58.2	0.59	85.0	21.3
BCT 19005	Triticale	24173	May 13	332	8.6	3.0#	5.8	36.6#	57.7#	7.1	61.4*	0.63*	97.5*	24.7*
BCT 19006	Triticale	27915	May 12	330	8.5	3.1#	5.8	36.7#	58.6	7.2	60.7	0.62	95.5	23.9
Triticale Mean		**25358**	May 12	**329**	**8.3**	**3.4**	**5.8**	**40.3**	**61.8**	**7.2**	**58.7**	**0.60**	**87.5**	**21.1**
Nomini (check)	Barley	15044#	April 23	341	14.2*	6.6*	10.5*	34.4#	55.6	9.0*	61.7*	0.63*	104.2*	19.2
P25R25 (check)	Wheat	25376	May 16	189	7.3#	3.7	5.5#	34. 4#	53.7	5.3#	62.7*	0.64*	107.7*	32.4*
Overall Mean		**24269**	**May 10**	**329**	**8.9**	**3.8**	**6.4**	**39.9**	**61.5**	**7.2**	**58.8**	**0.60**	**88.5**	**20.8**
$LSD_{0.1}$		3816	2 days	-	0.9	0.6	0.7	2.7	3.4	0.8	2.1	0.02	7.5	3.4

*,# Indicates the entry was either significantly greater (*) or significantly (#)less than the overall mean for that feed characteristic.

[1]Nitrogen uptake (lb N/acre) for each entry was estimated by multiplying the lb DM/ac X % nitrogen contained in the DM. The percent nitrogen for each entry was calculated by dividing crude protein by the conversion factor 6.25 which is the average amount of nitrogen (%) contained in protein.

[2]Crude Protein %: represents total nitrogen content of the forage; higher protein is usually associated with better feed quality.

[3]Soluble Protein %: non-protein N and portion of true proteins that are readily degraded to ammonia in the rumen.

[4]RDP (Rumen Degradable Protein): portion of crude protein that microbes can either digest or degrade to ammonia and amino acids in the rumen.

[5]ADF (Acid Detergent Fiber): represents the least digestible fiber portion of forage; the lower the ADF value the greater the digestibility.

[6]NDF (Neutral Detergent Fiber): insoluble fraction of forage used to estimate the total fiber constituents of a feedstock.

[7]Ash: mineral elements of the forage.

[8]TDN (Total Digestible Nutrients): measure of the energy value of the forage.

[9]Net Energy Lactation: estimate of the energy in a feed used for maintenance plus lactation during milk production.

[10]RFV (Relative Feed Value): indicates how well an animal will eat and digest a forage if it is fed as the only source of energy.

[11]Non Fiber Carbohydrates: represents all forms of digestible carbohydrates (starch, sugar, pectin, and fermentation acids) in the forage.

Table 3. Brands and companies in the 2019-2020 Maryland cereal forage trials.

Brand	Address
Eddie Mercer Agri-Services, Inc.	6900 Linganore Road Frederick, Maryland 21701 www.eddiemerceragri-services.com
Seed-Link Inc.	208 St. David Street Lindsay, Ontario (Canada) K9V-4Z4 www.seed-link.ca
TriCal Superior Forage	12167 Highway 70S Vernon, Texas 76384 tricalforage.com