



Forage Performance of Cereal Cover Crops in Maryland
Dr. Nicole Fiorellino – Extension Agronomist
2018-2019 Results
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Dairy farmers are constantly looking for sources of forage to meet their feed needs. One source that many of this 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 (17) representing two species (rye and triticale) 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 10, 2018. 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 by late fall.

In order to compare forage quality among the entries that headed over a period of two weeks, the timing of the spring biomass harvest was when the entries had reached late boot to early heading stage of development. The two rye varieties were harvested on April 23 while the triticale varieties were harvest on either May 1 or May 6, basing on heading date (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 60° 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. For each location, 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 in the biomass. These two factors were used to estimate nitrogen

uptake (Table 1). There was no significant difference in nitrogen uptake among the varieties tested. A number of forage quality characteristics for these cereals was measured (Table 1). The descriptions of the various quality characteristics are described here and in the footnotes at the bottom of Table 1. Crude protein (CP) is the nitrogen 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 had significantly greater CP than the overall mean, with one triticale variety having significantly less CP content than the overall mean. Both rye varieties 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%. One triticale variety had significantly lower NDF and ADF values than the overall mean, representing a digestible triticale variety. This same variety also had significantly higher total digestible nutrients (TD), net energy for lactation (NEL), relative feed value (RFV), and non-fiber carbohydrates (NFC).

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. Two triticale varieties had significantly higher RFV than the overall average but both rye varieties also had high RFV values, though not significantly different 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.

Table 1. Forage and cover crop performance of cereal species evaluated in Clarksville, MD during 2018-2019 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 Carbohydrates % DM
TriCal Exp 19R01	Rye	4912 [#]	April 19	106	13.8*	5.2	9.5*	38.2	62.4	6.8	59.0	0.61	88.3	15.3
TriCal Exp 19R02	Rye	5680 [#]	April 19	135	14.8*	5.1	10.0*	38.1	62.1	6.6	60.0	0.62	88.5	14.3
Rye Mean		5296	April 19	121	14.3	5.2	9.7*	38.2	62.3	6.7	59.5	0.61	88.4	14.8
Mercer MBX 814	Triticale	9556	April 30	169	11.2	4.4	7.8	40.9	66.1	6.8	58.8	0.6	80.5	14.4
Mercer MBXEXP 18-70	Triticale	8942	April 30	161	11.2	4.5	7.8	39.1	64.8	6.1	58.5	0.6	84.0	16.2
Mercer MBXEXP18-68	Triticale	8367	May 1	152	11.3	4.6	8.0	35.4 [#]	57.8 [#]	7.0	61.2*	0.63*	99.0*	22.0*
BCT 15509	Triticale	7752	May 6	140	11.2	4.7	7.95	41.5	67.8	6.5	56.3	0.58	77.5	13.5
BCT 15513	Triticale	9709	May 7	172	11.0	4.3	7.6	42.4	65.6	7.7	56.3	0.57	79.5	14.7
BCT18001	Triticale	10976*	May 6	194	11.1	4.8	7.95	44.8*	69.3*	7.5	54.5 [#]	0.55 [#]	72.5 [#]	11.3 [#]
BCT18002	Triticale	9671	May 4	158	10.5	4.7	7.6	44.7*	68.4*	7.7	54.1 [#]	0.55 [#]	74.3 [#]	12.9
BCT18003	Triticale	8674	May 3	154	11.1	4.7	7.9	38.9	61.1 [#]	6.0 [#]	60.1	0.62	92.5*	20.0*
TriCal Exp 08TF01	Triticale	8955	May 7	156	11.0	4.6	7.8	42.5	63.9	7.9	55.3	0.6	81.7	16.9
TriCal Exp 19T05	Triticale	8635	May 2	148	10.7	3.9	7.3	40.7	65.3	6.9	57.8	0.59	81.3	15.6
TriCal Exp 917	Triticale	9057	May 3	181	12.6	5.1	8.8*	35.8 [#]	61.9	7.3	59.5	0.61	91.7	16.3
TriCal Merlin Mix	Triticale	8136	May 6	131	10.0 [#]	3.5	6.8 [#]	44.5*	70.6*	7.7	53.6 [#]	0.55 [#]	71.8 [#]	10.9 [#]
TriCal Surge	Triticale	9288	May 6	166	11.5	5.1	8.3*	43.2	67.2	7.7	55.6	0.57	77.5	12.7
Trical 813	Triticale	5680 [#]	May 8	111	12.3	5.0	8.6*	40.3	64.7	6.4	58.3	0.60	83.0	15.2
Trical Gainer 154	Triticale	7215	April 30	128	11.2	4.4	7.7	37.9	63.8	6.6	58.8	0.61	86.8	16.9
Triticale Mean		8616	May 4	153	11.2	4.5	7.8	40.6	65.1	7.0	57.3	0.58	82.4	15.4
Overall Mean		8201	May 2	149	11.6	4.6	8.1	40.3	64.8	7.0	57.5	0.59	83.2	15.3
LSD _{0.1}		2398	1 day	-	1.2	-	1.0	3.7	3.6	0.9	2.8	0.03	8.6	3.4

.# Indicates the entry was either significantly greater () or significantly ([#])less than the mean

¹Nitrogen uptake (lb/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.

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

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

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

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

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

⁷Ash: mineral elements of the forage.

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

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

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

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