Proceedings, The State of Beef Conference
November 4 and 5, 2014, North Platte, Nebraska

ANNUAL FORAGES TO COMPLEMENT OR REPLACE PASTURE

Jerry Volesky
Range & Forage Specialist, UNL West central Research and Extension Center, North Platte, NE

Cool- and warm-season annual crops have long been an important forage source for many livestock producers. Their use may be routine for some operations for hay production or to have grazing available at specific times of the year. They are also often used to produce supplemental forage during dry conditions. Currently, relatively low grain prices combined with high cattle prices and a strong demand for pasture has resulted in many producers using cropland for annual forage production.

Cool-season Annuals

Winter Annuals

Rye, winter wheat, and triticale are the three winter cereal grains that are most commonly used for forage. In Nebraska, these primarily provide spring grazing or hay, but may have enough growth for fall or winter grazing depending on the planting date. All three of these grains can either be grazed or hayed, but rye is favored for grazing because of rapid early spring growth. Triticale is well suited for hay or silage with high late spring forage yield. There are winter barley and winter oat varieties available, but field tests have shown that their winter-hardiness is marginal under Nebraska conditions. Additionally, there are some annual ryegrass types and varieties can be planted as winter annuals. Forage yield of annual ryegrasses is typically less than that of the cereal grains, but they regrow rapidly after grazing and are usually higher in quality at similar stages of growth.

Spring-Planted Cool-season Annuals

Oats is the most common spring-planted cereal grain that is used. Although it is most often hayed, grazing can be done when the oats reaches a height of 6 to 8 inches, which typically occurs about the third to fourth week of May. Forage dry matter yield of oats can range from 2.5 to 3.0 tons/acre. Varieties of spring-planted wheat, triticale, barley, and annual ryegrass are available for forage (Table 1). Field peas can be included in seed mixtures of any of the cereal grains resulting in the potential benefit of increased quality and yield.

Table 1. Spring cereal forage harvest date, forage yield, crude protein (CP), and total digestible nutrient (TDN) content, North Platte, NE - 2012.

Entry	Harvest date[1]	Forage yield[2]	CP	TDN
		(tons/acre)	*%*	*%*
'Stallion' oats	21-June	2.56^{A}	12.1^{B}	58^{D}
'Haybet' barley	13-June	2.46^{AB}	14.7^{A}	67^{A}
'Shelby' oats	21-June	2.34^{AB}	11.6^{B}	57^{D}
Spring triticale	21-June	2.16^{B}	11.9^{B}	62^{C}
'Brick' hard red spring wheat	13-June	2.16^{B}	14.3^{A}	64^{B}
LSD $_{0.05}$	- -	0.33	0.6	1.1

[1] All entries harvested at an equal stage of maturity (late-milk to soft dough). [2] Dry matter basis.
^{AB} Means followed by unlike letters significantly differ (P < 0.05).

Cool-season Annuals for Fall Forage

All of the spring-planted small grain cereals can be planted with the intention of producing fall forage. Common scenarios for this might be after winter wheat harvest, corn silage, or a second crop after a spring or previous fall planted cereal grain. Planting dates might range from the last half of July until early September. Later planting dates will correspondingly result in less forage yield. Table 2 shows yield and quality results from several August-planted entries grown under irrigated conditions.

Table 2. Fall small grain height at harvest, forage yield, crude protein (CP) and total digestible nutrient (TDN) content, North Platte, NE – 2012[1,2].

Entry	**Height**	**Forage yield[2]**	**CP**	**TDN**
	(inches)	*(tons/acre)*	(%)	(%)
Spring triticale	38	4.48^{A}	15.9	61
'Shelby' oats	35	4.07^{AB}	14.4	60
'Haybet' barley	30	3.88^{B}	14.8	65
'Brick' hard red spring wheat	31	3.17^{C}	13.5	59
'Stallion' oats	32	3.08^{C}	18.3	62
'Ocala' annual ryegrass	14	1.62^{E}	19.1	64
'Fria' annual ryegrass	13	1.47^{E}	18.0	60
LSD $_{0.05}$	- -	0.56	- -	- -

[1] All entries planted on August 13 and harvested October 29, 2012.
[2] Dry matter basis.
^{ABCDE} Forage yield means followed by unlike letters significantly differ (P < 0.05).

Cover Crops – Forage Cocktails

Cover crop is a term often used to describe the planting of a short-term crop during the off-season of a convention grain crop. These can be used for soil protection, green manure, or for forage. They could be a single species, but often contain a mixture of cool-season cereal grains, warm-season annual grasses, legumes, and brassicas such as turnips or radishes. Planting could be done in the spring, as in the case of using them during the fallow period before fall winter wheat planting in a dryland wheat system. More commonly though, is the use of cover crops following harvest of winter wheat, soybeans, or corn silage. Aerial seeding of some cover crop species into standing corn or soybeans has had mixed results. An example of a cover crop mixture and forage yield results is shown in Table 3.

Forage production from cover crop mixtures or a single species is most successful when irrigation is available. In dryland situations in western and central Nebraska, plantings after winter wheat for example, would ideally have 5 to 7 inches of rainfall for significant growth and production. Soil moisture use by the cover crop might also impact the following year's crop.

Table 3. Total and individual species forage yield of an irrigated cover crop mixture planted into wheat stubble, North Platte, 2009 *.

Variety - Forage	Forage yield	Percent of total yield
	(tons/acre)	*(%)*
Regular Hegari (grain sorghum)	**	**
'Martin' Milo	2.02	69
Oil Seed Radish	0.30	10
'Purple Top' Turnips	0.05	2
'Red Ripper' Cow Peas	0.01	<1
'Indianhead' Lentils	0.01	<1
'Arvika' Forage Peas	0.45	15
Volunteer winter wheat	0.09	3
Total yield	2.92	

* Planting and harvest dates were July 24 and October 8, 2009.

** Regular hegari and milo were combined (not separated when harvested).

Warm-season Annual Grasses

Warm-season annual grasses (summer annuals) are used for summer pasture, green chop, hay, silage, and stockpiled for winter pasture. The summer annual grasses most often used for forage in Nebraska are sudangrass, sorghum-sudangrass hybrids, forage sorghums, foxtail millet, pearl millet, and teff (Table 4). Other species in this group that have been specifically plant for forage are corn and crabgrass. Each of these grasses has unique growth characteristics that require proper management for optimum production. Some of the desirable characteristics of summer annuals are rapid growth (especially in mid-season), excellent drought resistance, and good response to fertilizer and water. They are well adapted to most areas of the state and grow rapidly following planting in late May or June. They provide rapid growth from mid-July through August, and then moderate growth until stopped by fall frost. Planting may also occur up to the latter part of July with moderate yield still being obtained.

Table 4. Range of dry matter yield for warm-season annual forages grown under irrigated conditions.

Forage	Tons/acre
Sudangrass	4.1 to 4.8
Sorghum-sudangrass hybrid	4.2 to 5.3
Forage sorghum	4.4 to 5.3
Pearl millet	3.8 to 4.5
Foxtail millet	2.8 to 3.8
Teff	2.6 to 3.8

* Yield ranges include the primary and regrowth harvest for all forages except forage sorghum and foxtail millet.

Complementary Annual Forage Systems

Under irrigation, double cropping cool- and warm-season annuals will maximize potential forage production. There is a wide range of possible combinations that can be planted to best complement other available forage resources (Table 5).

Table 5. Examples of complementary annual forage combinations and periods of available grazing.

Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Rye		Native range	Sudangrass		Native range		
		Oats	Sorghun-sudangrass hybrid			Oats or cover crop mix	
	Triticale		Native range			Oats or cover crop mix	

Grazing Annual Forages

Proper grazing management of annual forages is critical to effectively utilize these resources. Because of trampling losses and the fact that grazing interrupts plant growth, grazing is not efficient as haying. The grazing of tall and rapidly growing warm-season annual grasses can be particularly challenging. Graze these summer annual grasses in a short, rotational grazing system. Subdivide fields into three or more pastures so that each pasture can be grazed down in 7 to 10 days. Stagger the date of planting each pasture by about 10 to 14 days so that grazing will begin on each pasture when growth is at the appropriate height. This rotation system allows maximum production of nutritious forage. Graze sudangrass and pearl millet when they reach 15 to 20 inches in height and sorghum-sudangrass hybrids when they are 18 to 24 inches tall. Graze down rapidly to 6 to 8 inches of stubble before moving livestock to a fresh pasture, and do not graze regrowth until at least 18 inches of growth accumulates. If growth is more than 36 inches tall, harvest as hay, green chop, or silage since grazing cattle will trample and waste much of the growth. Regrowth will be more rapid following cutting this taller growth than if it is trampled. For spring cool-season annuals such as oats, grazing can begin when plants are 6 to 8 inches tall. In the fall for cereal grains and cover crop mixtures, grazing typically begins in October after those forages have accumulated significant growth.

Whether grazed or harvested for hay, drought stress on many cool- and warm-season annuals increases the risk of nitrate accumulation in the forage. This risk is increased on fields that have had excess nitrogen fertilizer or manure applied. The young plants and leaves of sudangrass, sorghum-sudangrass hybrids, and forage sorghum contain a chemical that breaks down and is released as prussic acid (hydrocyanic acid). Its content in plants can be affected by climate, soil fertility, and plant maturity as well as variety. Its presence should not deter producers from realizing the potential value of these annual forage crops.

NOTES