



NEW RESEARCH HIGHLIGHTS ALTERNATIVE FORAGE OPTIONS

Forage is king. As the largest feed component on dairies, it often composes up to 60 percent of the lactating cow diet. When forage is in short supply, it limits options for feeding cows and can reduce the number of cows that a dairy can profitably milk.

Available land base, drought, lack of ground water, climate change and rain or frost at the wrong time all limit how much quality forage can be produced. Historically corn silage and alfalfa have been the predominant forages fed to dairy cows.

Researchers across the country have been studying alternative forage crops. They are looking for forages that support today's high-producing cows and deliver added benefits as well. Those added benefits include forages that need less water, that can be grown in a double-crop system to maximize forage production per acre and that can help remove additional phosphorus from the soil.

Several new research studies have substituted limited amounts of alternative forages for corn silage and alfalfa in lactating-cow diets. Milk production results have been similar, making these forages viable options to expand your forage supply. Take a look at the research summaries below to see which forages might best fit into your farm's cropping system.

TEFF HAY

Researchers at Kansas State University used teff hay as the sole forage in lactating cow diets. Teff hay is a warm-season annual grass native to Ethiopia that is very drought tolerant. Corn silage, alfalfa hay and prairie grass hay were the forages used in the control diet. Two diets with teff hay were evaluated. All three diets were formulated for similar dry matter (DM), crude protein (CP) and starch concentrations. The teff A diet was formulated to match the neutral detergent fiber (NDF) from forage in the control diet (18.23 ± 0.15% of DM). The teff B diet had an NDF of 16.63% from forage. DMI, milk production (89.7 lbs/day), milk fat content, lactose content, energy-corrected milk (ECM), body weight (BW) and body condition score (BCS) were unchanged by treatment. However, both teff hay diets increased milk protein concentration from 3.07%

to 3.16%. Results indicate that teff hay has the potential to replace alfalfa and corn silage in lactating cow diets without losing productivity. The study abstract was presented at the 2017 ADSA meeting (M171).

BROWN MIDRIB SUDANGRASS SILAGE

Researchers at the U.S. Dairy Forage Research Center in Wisconsin evaluated whether BMR sudangrass silage could successfully replace conventional corn silage or BMR corn silage in the diet of mid- to late-lactation cows. Diets were formulated to contain 40% corn silage, 20% alfalfa silage and 40% concentrate on a DM basis. BMR sudangrass silage was used to replace 10% of the corn silage in each diet—conventional corn silage or BMR corn silage. Results showed that DMI, milk production, protein, lactose, total solids percentage, ECM and feed efficiency were not affected by the inclusion of BMR sudangrass silage in the diet. Milk fat percentage, however, increased 0.15% for cows fed a diet with 10% BMR sudangrass silage. Researchers concluded that BMR sudangrass silage, which requires less water to grow and is highly digestible, could be used to replace 10% of conventional or BMR corn silage in the diet of lactating cows. The study abstract was presented at the 2017 ADSA meeting (M300).

WHEAT AND TRITICALE SILAGES

Penn State researchers evaluated if wheat silage or triticale silage could replace some corn silage in lactating cow diets without affecting production. Cows were fed a control diet containing 44% corn silage on a DM basis or a diet with 10% wheat silage or 10% triticale silage substituted for corn silage. DMI was unchanged, but milk yield declined slightly for wheat silage and triticale silage diets compared to the control diet, 91.3 lbs/day, 90.8 lbs/day and 94.1 lbs/day respectively. Researchers concluded that wheat and triticale cover crops planted after corn silage harvest and harvested at boot stage can support milk production above 90 lbs/day when included at 10% of the diet. For farms that need more forage, double-cropping wheat or triticale after corn silage harvest can help meet that need. Proper harvest timing of alternative forages is critical to produce highly

continued on page 2

IN THIS ISSUE

*New Research
Highlights Alternative
Forage Options*

From the Maternity Pen |
*RPC Benefits Transition
Cows and Their Calves*

Happenings |
*SoyPlus Salutes
Randy Daniel*

Consultants Corner |
Feed Her Immune System

Beyond Bypass |
*Feeding Palmitic Acid
Boosts Mid-lactation
Performance*

Quality Corner |
*SoyPlus and SoyChlor
Announce Promotions*

continued from page 1

NEW RESEARCH HIGHLIGHTS ALTERNATIVE FORAGE OPTIONS

digestible forages to support cow performance. The study was reported in the August 2017 *Journal of Dairy Science* 100:6151.

BMR FORAGE SORGHUM AND OAT SILAGES

Penn State researchers also evaluated BMR 6 dwarf forage sorghum silage and fall-grown oat silage as ways to increase forage options while maintaining cow productivity on farm. Cows were fed a control diet containing 44% corn silage on a DM basis or a diet with 10% BMR sorghum silage or 10% oat silage substituted for corn silage. Results showed that sorghum silage decreased DMI, milk yield and milk protein content, but increased milk fat content and maintained ECM similar to control. Results for the oat silage diet showed DMI, milk yield and milk components were unchanged compared to control. Researchers concluded that both forages could support milk yield above 83.8 lbs/day when included at 10% of the diet DM and provide options to increase the amount of forage grown on farm. Proper harvest timing of alternative forages is critical to produce highly digestible forages to support cow performance. This study was reported in the July 2017 *Journal of Dairy Science* 100:5250.

TRITICALE AND CRIMSON CLOVER SILAGE

Kansas State University researchers also evaluated a mix of beardless triticale and crimson clover as a winter cover crop to see if it could support milk production and remove phosphorus from the soil. One field of triticale/clover had lagoon water applied; the other field had solid manure applied during the growing season. Cows received a diet with triticale/clover silage (TCS) at 15% of DM or a control diet where TCS was replaced by alfalfa and grass hay. The TCS diet also included additional bypass soybean meal in order to balance the metabolizable protein supplied across both diets. Cows fed the TCS diet ate less, 48.4 lbs/day vs. 55.9 lbs/day DMI for control cows. However, both groups produced nearly the same amount of milk, 80.86 lbs/day for TCS cows and 80.75 lbs/day for control cows. ECM and fat corrected milk were similar across diets. But because of the change in DMI, feed efficiency (ECM/DMI) was greater for cows fed the TCS diet, 1.71 vs. 1.48 for control cows. The winter cover crop of triticale and clover produced more than 3 tons of DM/acre, with a CP content of 21.1%, and removed 38 lbs/a of potassium and 320 lbs/a of phosphorus. This research will be reported at the Kansas Dairy Days in January.

HAPPENINGS

SoyPlus Salutes Randy Daniel



Following more than three decades of service to SoyPlus, Randy Daniel retired last month from his role as production manager.

Randy joined the Landus Cooperative team in 1985, shortly after SoyPlus debuted to the dairy industry. Randy was there at the beginning. As the cooperative worked through the many challenges that came with launching a national brand for the first time, Randy quickly proved his ability to understand quality manufacturing processes. He moved up the ladder within the production plant,

lending his invaluable knowledge of manufacturing and understanding of soy crushing to multiple plant expansions.

Randy's impact on the SoyPlus story is enormous. For 32 years he has championed the importance of delivering consistent product. He never settled for second best.

Randy's service to our customers and his generosity to his team-members have never gone unnoticed, and his presence on the team will be sorely missed. But as the Dairy Nutrition Plus team reflects on Randy's career in gratitude and awe, we look forward to continuing the legacy of quality he helped create, with a manufacturing team that's nothing short of the best. That's what Randy taught them to be.

From the entire Dairy Nutrition Plus team, Congratulations, Randy! Thank you for 32 years of service, leadership and friendship!



FROM THE MATERNITY PEN

RPC Benefits Transition Cows and Their Calves

New research from the University of Florida, conducted by Marcos Zenobi, PhD candidate, and Charles Staples, professor of dairy science, shows that feeding rumen protected choline (RPC) for six weeks during the transition period provides long-term benefits for transition multiparous cows and their calves.

In the study, prepartum cows were fed 0 or 60g of RPC daily and received either a high energy diet (1.63Mcal NEL/kg DM) or a controlled energy diet (1.40 Mcal NEL/kg DM). After calving, cows received the same diet (1.68 Mcal NEL/kg DM) balanced for methionine through 15 weeks postpartum. RPC supplementation stopped at three weeks postpartum. Results showed that:

- The positive effects of RPC were independent of prepartum energy intake.
- RPC-supplemented cows produced more milk than non-supplemented cows during the first 15 weeks postpartum, 95.9 lbs/day vs. 91.1 lbs/day.
- The milk production increase continued through 40 weeks of lactation, 81.8 lbs/day vs. 77.2 lbs/day.
- While RPC-supplemented cows were in a more negative energy balance at two and three weeks postpartum, they did not have increased NEFA or BHBA levels.
- RPC-supplemented cows had a lower daily prevalence of subclinical hypocalcemia (10.5% vs. 25.5%) than non-supplemented cows during the first seven days postpartum. A blood calcium level of <8.0mg/dL was used as the cutpoint to determine subclinical hypocalcemia.
- Colostrum yield was unchanged. But the concentration of IgG in colostrum from RPC-supplemented cows was 86.9 g/L compared to 68.2 g/L for non-supplemented cows.
- Heifers born from dams that received RPC supplementation had a slightly better rate of average daily gain from 2 months to 12 months of age, 1.96 lbs/day vs 1.87 lbs/day.
- Pregnancy at first timed AI was greater for heifers born from RPC-supplemented cows compared to heifers born from non-supplemented cows, 41.3% vs. 23.6%.

CONSULTANTS CORNER

Feed Her Immune System



JUAN J. LOOR

University of Illinois

Traditionally, dairy nutritionists have been taught to focus on meeting production requirements for cows. Little time was spent trying to understand the maintenance portion of the diet and how it might affect animal performance.

However, recent research has provided substantial evidence that the immune system (part of the maintenance requirement) is intimately involved with other mechanisms that allow cows to adjust quickly to the onset of lactation without suffering chronic disorders. We now know that cows that lag behind the herd in production outcomes often have greater inflammatory status and compromised liver function during the periparturient or transition period (Bionaz et al., 2007; Bertoni et al., 2008; Trevisi et al., 2012). Animals that are health-impaired also have lower dry matter intakes, possibly from the anorexigenic effects of inflammatory molecules (Plata-Salaman, 1998, 2001; Wong and Pinkney, 2004). It is also now generally accepted that the negative energy balance that occurs postpartum is mainly caused by the reduction in DMI rather than the increased demand from the mammary gland (Grummer et al., 2010).

So how can we help cows transition better? There is a tendency to reach for pharmaceutical treatments to combat inflammatory responses in cows at parturition. But nutritional strategies should be part of the solution, too. Nutritional strategies have been shown to help boost the immune system and combat transition-cow problems. This new frontier in dairy cattle nutrition is called immunonutrition.

Pharmaceutical treatments will still be needed, but they should be part of an overall systems approach that includes new nutritional strategies. Using nutrition to focus on the health and immunity of cows, in addition to production goals, must be the new way forward. We live in a world with increased consumer scrutiny over the care that food animals receive. Nutrition, cow comfort, animal handling and treatment—when needed—are all part of the systems approach needed to help cows successfully transition into lactation.

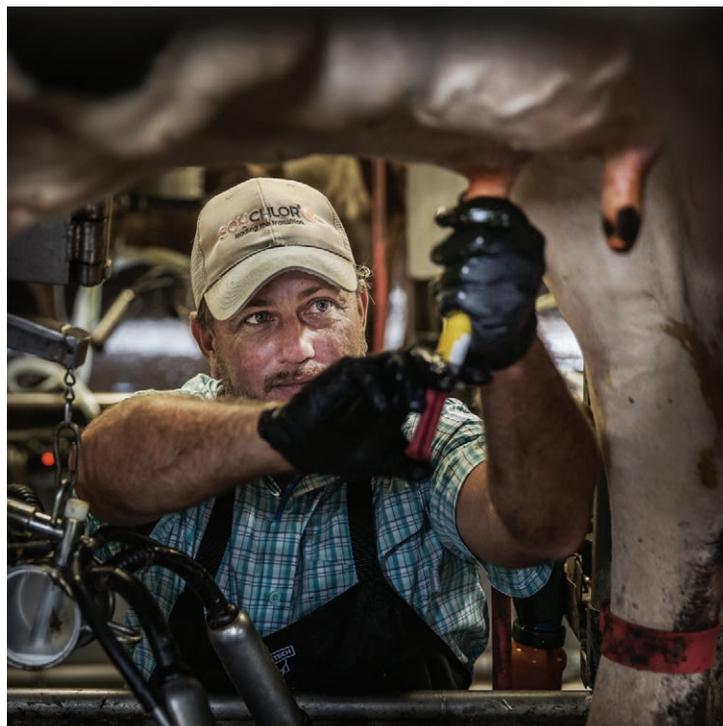
In recent years researchers have discovered nutritional strategies that enhance immune function. Nutrition companies have developed immunostimulants that can be fed as dietary supplements. These immunostimulants have demonstrated positive effects on immune function including improved leukocyte function.

Another rising area of new research is with amino acids. Methionine, lysine and, just recently, histidine have been identified as limiting amino acids for milk production. When fed in rumen-protected form, these amino acids allow cows fed less crude protein to still produce the same amount of milk, with less nitrogen excreted as waste.

Methionine and choline are also methyl donors. The liver and mammary glands require methyl donors for optimal function. Microbial degradation in the rumen can leave cows short of methyl donors (Sharma and Erdman, 1989; Girard and Matte, 2005). Methionine in particular, when fed in rumen-protected form, can help cows meet that dietary requirement and transition better. Recent research has also demonstrated the ability of methionine and choline to stimulate the immune system during the transition period (Zhou et al., 2016; Vailati-Riboni et al., 2017).

These are just a couple of examples of the new nutritional strategies available today. Nutritional research now looks at interactions at the cellular level to find the best way to deliver the nutrients cows need for optimal health and productivity. When it comes to immunonutrition, we have only just scratched the surface. The results available so far indicate that some feed additives and nutrients have a positive immunomodulatory effect in dairy cows, especially during periods of stress such as during the transition into lactation.

To learn more on this new area of research, please read, "Physiologic and Molecular Implications of Amino Acid Balancing during the Periparturient Period in Dairy Cows," which was presented at the 5th International Symposium on Dairy Cow Nutrition and Milk Quality.



BEYOND BYPASS

Feeding Palmitic Acid Boosts Mid-lactation Performance

Most studies feeding palmitic acid (PA) have been short term—21 days or less. New research from Michigan State University supplemented primiparous and multiparous mid-lactation cows with PA for 10 weeks. The supplemented cows showed consistent production responses throughout the study. In addition there were carryover effects of the treatment on the yield of milk fat and energy-corrected milk.

On average, cows were enrolled in the trial at ~140 days in milk and were producing ~103 lbs of milk per day. All cows received the same control diet for two weeks. For the next 10 weeks treatment cows were supplemented with PA to equal 1.5% diet dry matter. (PA replaced soyhulls in the diet.) During the 10-week treatment period PA-supplemented cows, when compared to control cows, showed the following improvements in performance:

- Dry matter intake up 5.0 lbs/day.
- Milk yield up by 8.4 lbs/day.
- Milk fat content improved from 3.15% to 3.35%.
- Milk fat yield increased from 3.1 to 3.4 lbs/day.
- Energy corrected milk increased from 95.5 to 104.1 lbs/day.

After 10 weeks, test cows were switched back to the control diet and monitored for two additional weeks. During the carryover period, compared to control cows, PA-supplemented cows tended to have increased energy-corrected milk, 88 vs. 92 lbs/day; increased 3.5% fat-corrected milk, 89 vs. 93 lbs/day; and greater milk fat yield.

Researchers also noted some parity interactions with treatment. PA supplementation increased the yield of milk and milk components in both primiparous and multiparous cows with the greatest increase observed in multiparous cows. While both primiparous and multiparous cows gained body weight during the study, PA supplementation increased energy partitioning toward body reserves in primiparous cows but not in multiparous cows. In addition, the carryover effect on ECM, FCM and milk fat was greater in multiparous cows than in primiparous cows.

QUALITY CORNER

SoyPlus and SoyChlor Announce Promotions

A tradition of quality and consistent manufacturing continues with the promotion of two homegrown production leaders on the Dairy Nutrition Plus team.

Kevin Grundmeier was promoted last month to SoyPlus production manager, leading the manufacturing team in Ralston, Iowa. Kevin previously served as SoyChlor production manager where he worked since 2005. He's worked for Landus Cooperative for nearly three decades and has helped build the SoyChlor brand through his unwavering commitment to quality and consistency.

"Kevin is highly qualified for this role with the manufacturing experience he brings. He's been manufacturing nothing but the best for the Dairy Nutrition Plus team for decades. Kevin cares about the customer, and that shows in the products he manufactures and the way he leads a team," said Mark Cullen, chief animal nutrition officer overseeing the Dairy Nutrition Plus product line.

Paul Lowry was also promoted last month to SoyChlor production manager. Lowry has been a part of the SoyChlor team since its first years of production, and he brings to the role 15 years of experience working to maintain quality and consistency in the HACCP and ISO certified SoyChlor plant.

"Paul has been a part of the SoyChlor process from the beginning. Through the years he's demonstrated his commitment to high-quality



KEVIN GRUNDMEIER

SOYPLUS
production manager



PAUL LOWRY

SOYCHLOR
production manager

production and maintaining consistent processes. He demonstrates our company's values through his thoughtful leadership and attention to customer needs," Cullen said.

The Dairy Nutrition Plus team is thrilled to welcome Kevin and Paul into their new roles and to watch the tradition of quality management and consistent production continue to grow through their contribution of experience, knowledge and commitment to customers.