
floury
LEAFY
CORN SILAGE
NorthStar
Genetics
BRED FOR
YOUR COWS
NorthStar Genetics



























NorthStar Genetics

Proud to be 100% Western Canadian owned and focused.

ON THE COVER: Leon Torkelson and his sons Rylan (left) and Weston (right) with a crop of 932S in Millicent, AB. Leon has a 500 calf feedlot as well as 400-450 cows. Leon grew over 27.3 mt per acre of silage and was very happy with how well his calves did on the 932S. *"We found it was easier to put pounds on and experienced better weight gain on our yearlings while feeding 932S."*

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Image: Kody and Rachel Traxel with their dogs Reba and Sage, and a crop of 961S, near Seven Persons, AB

Thank you for your interest in silage and grazing-specific corn hybrids from NorthStar Genetics. We are pleased to offer you a range of products for Western Canada including our Early Floury, Floury Leafy and Full-Floury Leafy Corn Silage Hybrids, all of which are Grazing Approved.

We know that feed is one of your largest expenses, and that the yield and quality of the forage you raise and harvest each year plays a vital role in the health of your animals, their productivity, and of course your bottom line.

These products are bred for your cows and not your combine. They are designed to create high quality forage to maximize animal performance, and are being successfully used by beef, dairy, bison and sheep producers for silage and grazing in Western Canada. Their moist, breakable kernels and flexible stalks are ideal for making feed.

These unique genetics are the cornerstone of our corn product portfolio, as we see an ever increasing number of progressive producers embracing corn for silage and grazing in their livestock businesses.

High quality forage is the foundation of any successful ruminant livestock operation. It is our hope that our corn products bring value and peace of mind as you focus on producing high quality milk and meat.

Thank you for your valued business,



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NORTHSTAR GENETICS' CORN HYBRIDS:

We are proud to offer you the following silage and grazing-specific hybrids that are Bred for Your Cows and not your combine:

913S
early FLOURY CORN SILAGE

2100-2200 CHU 75 Day RM
Floury Starch
Non-Leafy
White Cob Colour
Tall Plant Height
Planting Population 32 – 34,000
Available as conventional **910S**

924S
floury LEAFY CORN SILAGE

2225-2325 CHU 83 Day RM
Floury Starch
Leafy
White Cob Colour
Very Tall Plant Height
Planting Population 30 – 32,000
Available as conventional **920S**

928S
full floury LEAFY CORN SILAGE

2300-2400 CHU 86 Day RM
Full Floury Starch
Leafy
Pink Cob Colour
Very Tall Plant Height
Planting Population 30 – 32,000

932S
floury LEAFY CORN SILAGE

2350-2450 CHU 89 Day RM
Floury Starch
Leafy
White Cob Colour
Medium - Tall Plant Height
Planting Population 30 – 32,000

951S
floury LEAFY CORN SILAGE

2375-2475 CHU 90 Day RM
Floury Starch
Leafy
White Cob Colour
Very Tall Plant Height
Planting Population 30 – 32,000

961S
floury LEAFY CORN SILAGE

2450-2550 CHU 95 Day RM
Floury Starch
Leafy
White Cob Colour
Very Tall Plant Height
Planting Population 30 – 32,000

*** All of these products are grazing approved. We recommend that the Leafies be planted at 32,000 ppa if they are being grown for grazing. This helps to keep stalks a little thinner and easier on the hooves.**

Roundup Ready 2 CORN



Image: 913S at Watrous, SK

BRED FOR YOUR COWS
NorthStar Genetics

GRAIN VS SILAGE

Breeding has a profound effect on the architecture and behaviour of a corn hybrid. As a result of very different breeding goals, ideal grain and ideal silage hybrids have mostly OPPOSING characteristics.

BREEDING FOR GRAIN

Approximately 92% of North American corn acres are grown for grain. In order for a grain hybrid to perform, it must have durable kernels that will stay intact during combining, shipping and elevating. These kernels must also dry quickly to save on the cost of mechanical drying. To ensure the successful harvest of a grain crop, breeders select grain hybrids to have stiff stalks that will stand late into the season. These hybrids are also designed to have a relatively high ear placement on the plant for ease of combining. Grain farmers are paid on the basis of kernel integrity, test weight and kernel moisture. Thus a successful grain hybrid must have three key kernel characteristics: they must have a vitreous, or glass-like kernel type (which makes them hard, tough and heavy), the kernels must be relatively small (to further reduce the likelihood that they will fracture during mechanical processing), and they must dry rapidly on the plant as it reaches maturity (to save on drying costs). Grain-type hybrids, with their small, fast drying, vitreous kernels, are ideal for delivering high quantities of starch in compact transportable packages to distant markets.

Dual purpose hybrids bred for grain do not make ideal silage. Here's why:

THE STARCH

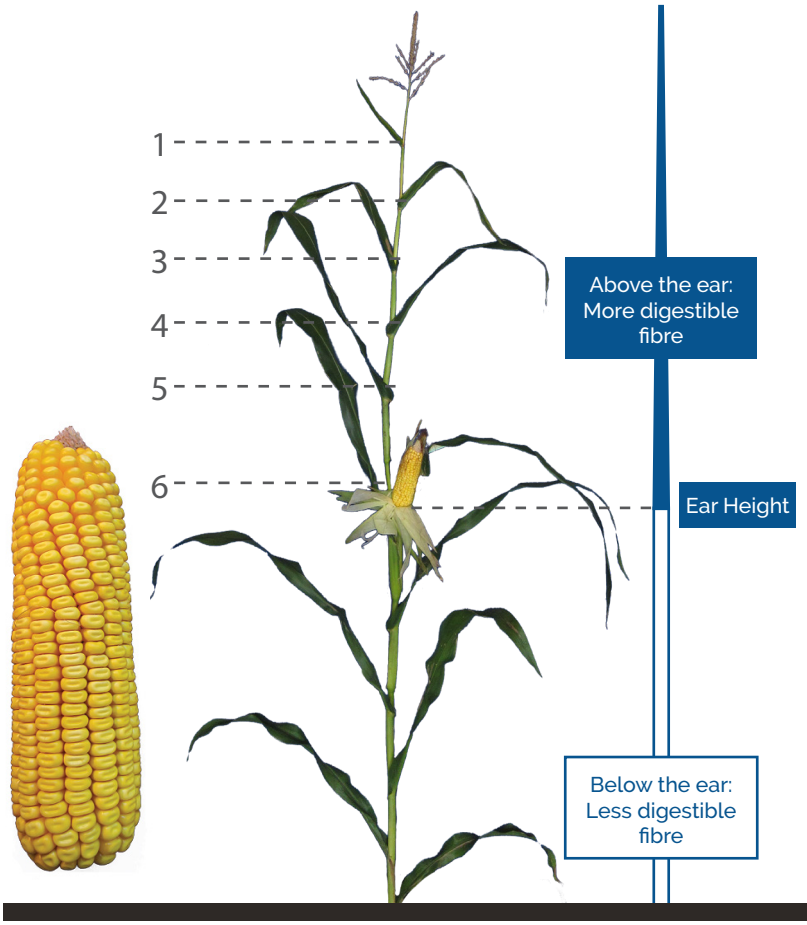
As a grain hybrid reaches silage maturity, its kernels dry rapidly and get very hard. This rapid drying creates a very narrow silage harvest window, which is further complicated by the extended stay green of the grain hybrid's stalk. Often, when the kernels reach a silage appropriate moisture, the plants are too green and wet to put in the bunker. If the plant is harvested once the plant reaches silage-appropriate moisture levels, the kernels have likely become hard and dry. While the kernels may have a high starch content, they remain whole or fracture into large pieces during silage harvest and cow chewing; but, much of the starch is unavailable in the rumen for milk production. In order to soften these large hard chunks of starch, a minimum storage period of six months is recommended. This long storage period increases storage space requirements and dry matter losses, and does not guarantee ideal starch quality by the time it is fed. Starch can be made more digestible by processing, but this damages effective fibre and does not consistently reduce starch to a particle size that is comparable with a hybrid that has a more digestible kernel type.

THE FIBRE

A successful grain hybrid is bred to withstand the elements until late season harvest, which requires the stalk to be stiff and solid. In addition, its ear must be positioned high on the plant to ensure successful harvest by the combine. Both of these requirements reduce fibre digestibility. The ear is the heaviest part of the plant, so the below ear portion of the stalk must be heavily lignified in order to support it. By raising the ear position and selecting for stiff stalks, grain hybrids produce a high proportion of indigestible fibre.

It can be difficult to harvest a grain hybrid for silage when its stalk is at the appropriate moisture level. It can pass from too wet to too dry rapidly and this reduces silage quality and feed efficiency. Excessively wet or dry silages often result in inadequate fermentation and unstable silage products.

IDEAL GRAIN

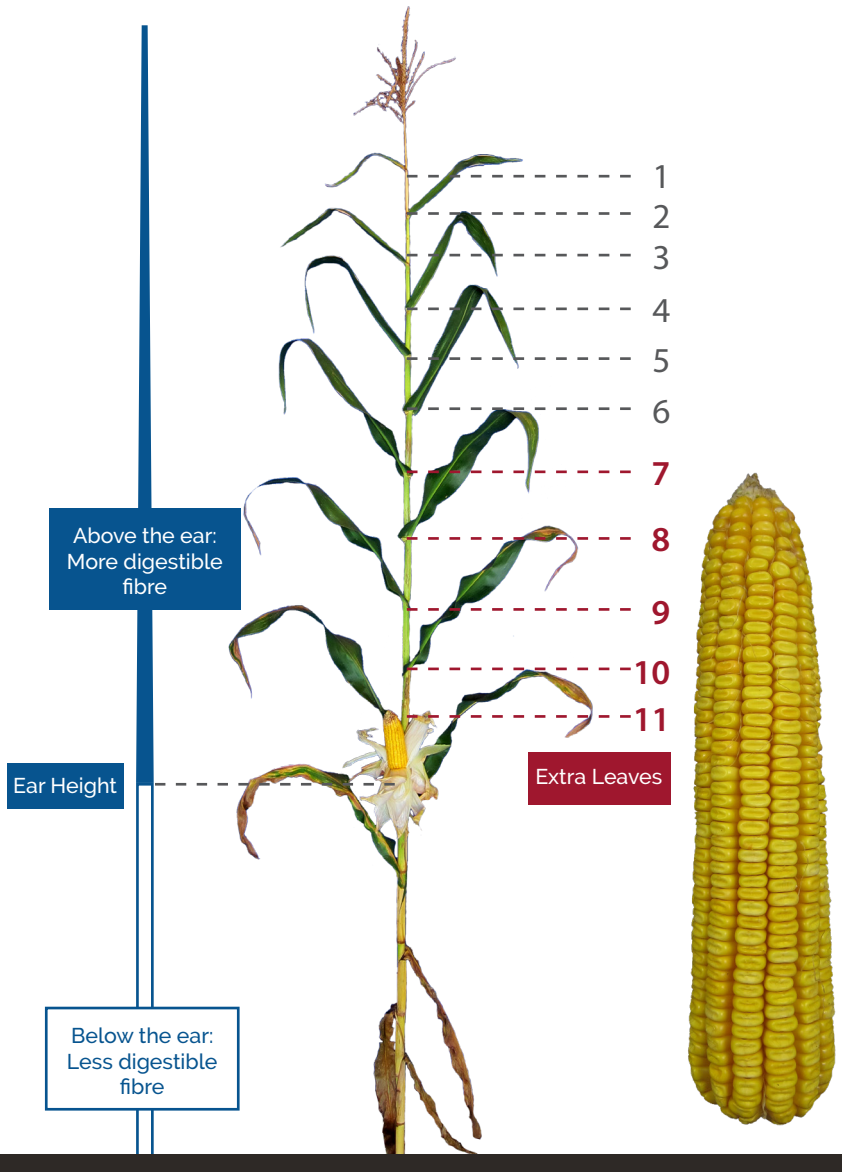


BREEDING FOR SILAGE

Roughly 8% of North American corn acres are grown for silage. Ideal corn silage harvest occurs when the crop has reached 65% moisture and 50% kernel milk line. During this harvest window, the whole plant is cut low to the ground and is chopped into small pieces before being packed into a silo or bunker. Then the corn is ensiled and mixed into a TMR and fed to cows for a season or more. Given this process, an ideal silage hybrid must satisfy an entirely different set of parameters than a grain hybrid. It must have a high total plant yield of digestible starch and fibre, a long harvest window in which the plant dries to the appropriate moisture and remains there for an extended period, adequate sugars to promote fermentation, and a relatively short storage period to save on space and reduce dry matter losses.

Ultimately, a corn silage hybrid must produce a reliable high-yielding, fermentable crop that when fed to cows promotes healthy and efficient rumination that is conducive to the production of a high quality milk and beef.

IDEAL SILAGE





Above: Shaved ears of a silage-specific hybrid (top) and a dual purpose grain hybrid (bottom) at silage stage. We see a high proportion of soft, floury starch in the silage-specific, contrasted with a lot of hard vitreous starch in the grain-bred hybrid.

Commercial grain hybrids cannot be the best silage hybrids since breeders select mostly opposing physical characteristics during breeding and testing.

	Ideal Grain	Ideal Silage
Yield	High grain yield with high test weight.	High total plant yield of digestible forage.
Kernel Moisture	As dry as possible at grain harvest time.	50% milk line for as long as possible at silage harvest time.
Kernel Hardness	As hard as possible to decrease possibility of breakage.	Soft and easily broken for maximum digestion in the rumen.
Kernel Size	Small to decrease possibility of breakage.	Large to increase possibility of breakage.
Stalk Moisture	Wet to keep plant alive as long as possible to reach ideal grain harvest.	Dries to achieve 65% total plant moisture and stays in that range to extend harvest window.
Stalk Integrity	As stiff and solid as possible for late season grain harvest.	As soft and flexible as possible, yet strong enough to remain standing through late silage harvest.
Ear Height	High position on the plant to ensure harvest by combine.	Low position on the plant to increase proportion of digestible fibre above the ear.
Ideal At Harvest	Wet strong stalk that supports ears of vitreous, hard, dry kernels.	Large plant with a soft stalk and moist ear of large breakable kernels. Stalk and ear dry at a complimentary rate.



Above: Dr. Glenn in a research trial



Above: Research plot harvest from above

Below: A shaved Full Floury Leafy ear



RESEARCH & DEVELOPMENT

BREEDING THE PARENT LINES

In our breeding nursery, we hand-craft robust inbred parent lines that have been selected for silage-specific characteristics. This process of careful observation and pollination takes six to twelve generations. During these seasons, our advancing inbred parents are exposed to a wide range of environmental pressures from extreme weather events, to drought and diseases. Each event is an opportunity to advance only our best genetics and eliminate the rest.

HYBRID TESTING AND ADVANCEMENT

Each of our products is rigorously evaluated in a range of environments. The silage hybrids that make their way to the marketplace must withstand the rigors of at least three seasons at multiple locations and produce a high yield of high quality forage. They must demonstrate a wide silage harvest window in which the ear and total plant dry slowly after reaching silage maturity. Their kernels should be large and slow drying, allowing them to be easily broken in the silage processing system.

Yield trials are evaluated by a research chopper with an onboard NIR. The NIR generates data on dry matter yield, starch content, NDF content and digestibility, protein and moisture content. We also conduct a visual analysis of each plot and give a score for ear size, stay green and root lodging, among other plant and agronomic characteristics.

Of all the new hybrids that we test each year, less than 1% are commercialized. The products that are available to you are the best of the best.



All of NorthStar Genetics' silage-specific hybrids make excellent grazing products. Their soft breakable kernels, flexible stalks and ability to retain leaves and ears throughout the winter makes them a perfect fit for your cows. Your herd will enjoy plenty of digestible starch, fibre and greater grazing days with our grazing approved hybrids. NorthStar Genetics' hybrids have excellent clean-up and the cows are less likely to be injured by stalk residue as they graze the paddock.

APPROVED GRAZING APPROVED

PRODUCT CATEGORIES

early FLOURY CORN SILAGE

913S is an early maturing silage-specific corn type that produces an ear with highly digestible starch and improved fibre digestibility. It produces flex ears that are composed of large, slow drying kernels with a high proportion of floury starch for a boost in starch digestibility. **913S** has been bred for total plant silage performance and never for grain characteristics.

floury LEAFY CORN SILAGE

Floury Leafy Corn Silage Hybrids **924S, 932S, 951S** and **961S** are bred to produce big yields of digestible fibre and floury starch. They are big, robust, distinctive plants. The Leafy gene allows them to produce 8 to 13 leaves above the ear. Their flex ears are composed of large, slow drying kernels with a high proportion of floury starch for a boost in starch digestibility.

full floury LEAFY CORN SILAGE

928S has all the benefits of a Floury Leafy with the addition of more digestible starch. In your field, **928S** will produce ears with 100% floury kernels for maximum starch digestibility.



IDEAL CORN SILAGE CHARACTERISTICS

NorthStar Genetics' silage-specific corn hybrids are bred for the unique characteristics below:



STRONG AGRONOMICS

Silage hybrids need good stalks, drought and disease resistance, and strong roots in order to produce reliable feed.



HIGH TOTAL PLANT YIELD

A corn silage hybrid should balance high yields of both digestible fibre AND starch.



LONG HARVEST WINDOW

To ensure the best quality silage makes it into the bunker, a hybrid should be slow-drying once it reaches optimal harvest moisture.



READY TO FEED SOONER

Livestock producers need a fermentable silage that can be fed soon after harvest to save on storage space and to reduce dry matter losses.



HIGH STARCH CONTENT

Corn silage needs plenty of energy-rich starch to make milk and beef.



HIGH STARCH DIGESTIBILITY

For maximum availability of starch, kernels should break up easily into small particles at harvest and during cow chewing.



HIGH FIBRE DIGESTIBILITY

Livestock producers need a corn plant that has high NDF digestibility and sufficient effective fibre to promote healthy rumination.



RATION TYPE ADAPTABILITY

A silage hybrid needs to be versatile so that it can be balanced in various rations to satisfy the nutritional needs of all cow groups on the farm.



EXCELLENT FEED QUALITY

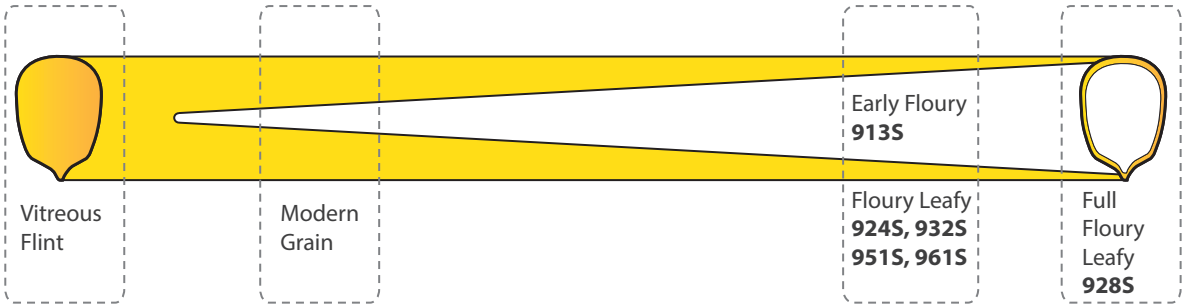
Silage in the ration must be palatable and promote healthy rumination, while providing the nutrition necessary to keep a herd healthy and productive.

EXPECT MORE FROM YOUR SILAGE CROP

Why choose a few great silage characteristics when you can have them all?

Many corn silage hybrids boast only one quality of the plant, such as fibre digestibility, grain yield or kernel type. Chances are that the other characteristics of these hybrids were bred for grain. The best silage products have been bred to achieve total plant silage qualities:

	Dual Purpose Grain Hybrid	early FLOURY CORN SILAGE	floury LEAFY CORN SILAGE	full floury LEAFY CORN SILAGE
Strong Agronomics	●	●	●	●
High Total Plant Yield	●	●◀	●●	●●
Long Harvest Window		●	●	●●
Ready to Feed Sooner		●	●	●
Ration Type Adaptability	●	●	●	●
Excellent Feed Quality		●	●	●
High Fibre Digestibility		●	●	●
High Starch Content	●	●	●	●
High Starch Digestibility		●●	●●	●●●



Above: Dual purpose grain hybrids have a modern grain type kernel with more vitreous starch, while our silage-specific corn hybrids have more floury endosperm types.

FLOURY CORN SILAGE

The digestible starch of our silage-specific hybrids provides far-reaching benefits in the livestock system:

NorthStar Genetics' 913S, 924S, 928S, 932S, 951S and **961S** have a silage-specific kernel type that behaves differently in the field, the chopper, the bunker and the rumen. They contain a naturally occurring recessive gene called opaque-1. All kernels are selected to be large, soft, and slow drying so that they will fracture easily during silage chopping and cow chewing for maximum starch digestibility.

The floury kernels are composed of a very thin layer of vitreous starch that surrounds the outer parts of the endosperm. This layer is approximately 0.2mm thick. The rest of the starch in the endosperm is white and powdery. Even as kernels reach full maturity, they pack in more floury starch and never deposit more vitreous starch. This simple change in endosperm type has far reaching benefits in the livestock system.

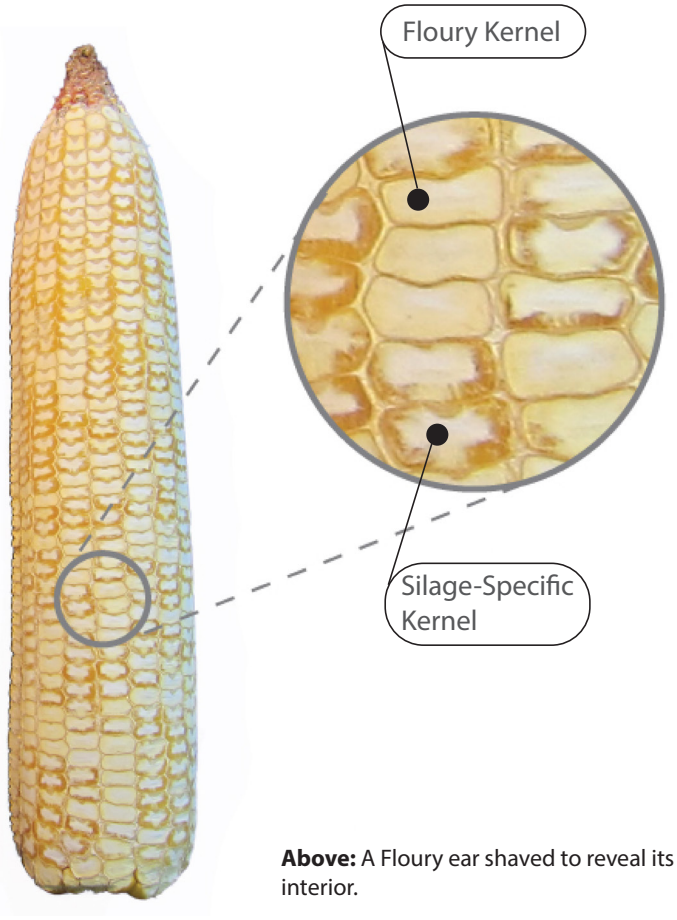
early FLOURY CORN SILAGE

floury LEAFY CORN SILAGE

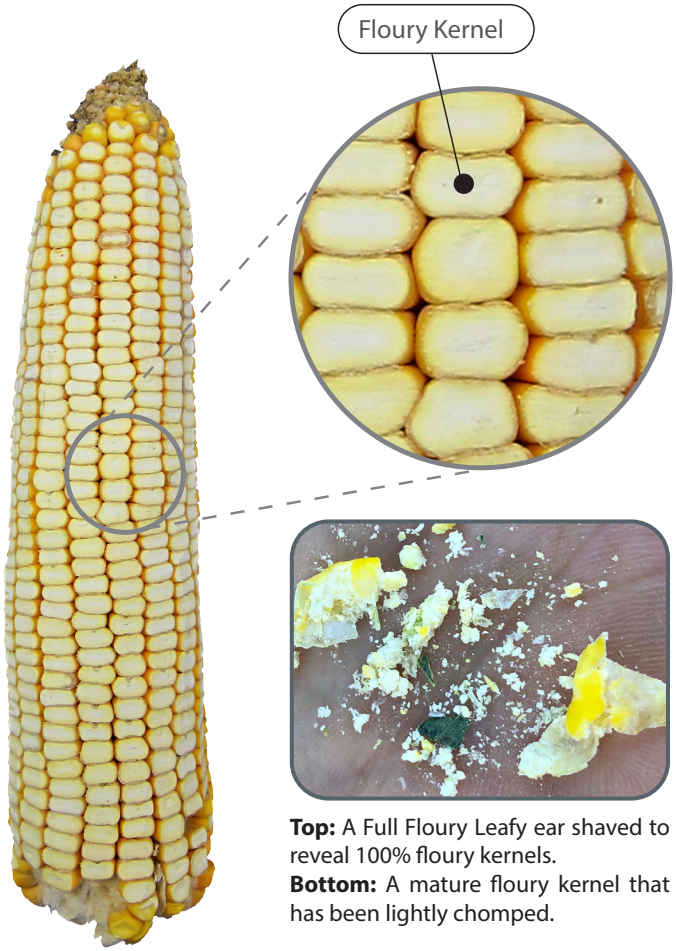
full floury LEAFY CORN SILAGE

913S, 924S, 932S, 951S and **961S** produce an ear with two distinct kernel types. Seventy-five percent of the kernels on their ears are large, soft, slow drying silage-specific kernels with a floury core. The other 25% of their kernels are completely floury as a result of having the recessive opaque-1 gene in one parent of the hybrid.

928S contains the recessive opaque-1 gene in both parents of the cross, resulting in the production of 100% floury kernels on its ears.



Above: A Floury ear shaved to reveal its interior.



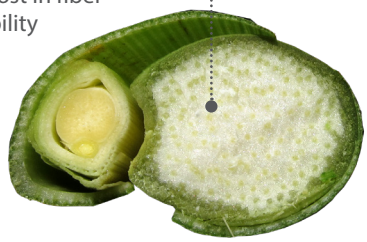
Top: A Full Floury Leafy ear shaved to reveal 100% floury kernels.
Bottom: A mature floury kernel that has been lightly chomped.

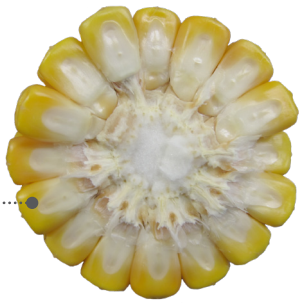
OBSERVE THE DIFFERENCE

Leafies have been bred and tested exclusively for silage. The physical differences resulting from this decades-long breeding program are so evident that they can be easily observed.

To contrast a Leafy with another corn type that is being considered for use as silage, select two hybrids of similar maturity and grow them next to one another at their respective recommended populations. In the week before silage harvest, take some time to compare them in the field. Note differences in height, ear size and stalk girth. Check out their stalk flexibility with a push. Pull out a knife and slice the stalks of each type at the same internode. Note the resistance to cutting and the composition of stalk interiors. This is your fibre. Husk and snap some ears. Compare the rigidity of their inner cobs and consider which would be more digestible. The inner cobs make-up between 8% and 10% of harvested dry matter. Contrast kernel sizes and pop some of each in your mouth to see which is softer and more palatable. Shave the kernels below their caps with a knife. Observe the proportion of vitreous and floury starch inside each type. This is your starch quality. If you're able, chop, store and feed the two products separately and let your animals tell you which they prefer. This will be the test that counts!

Leafies produce thick, juicy stalks for a boost in fiber digestibility





Leafies are bred to produce big flex ears that set large, soft, slow-drying kernels on soft cobs for a boost in digestibility





Leafies are big plants that produce a high yield of digestible fiber

1
2
3
4
5
6
7
8
9
10
11

Extra Leaves

Above the ear: More digestible fiber

Ear Height

Below the ear: Less digestible fiber

LEAFY CORN SILAGE & PLANT POPULATION

Leafies have a different plant architecture and the key to realizing all of their silage-specific benefits is a lower maximum plant population of 28,000 to 30,000 plants per acre, final stand.

How does leaf area translate into yield?

A corn plant's leaves are the factories that convert sunlight to yield. The chloroplasts within leaf cells produce glucose sugars during photosynthesis. This sugar energy is used for plant growth and development while the plant is young. After the plant flowers, these sugars are transported to the developing kernels on the ear to become starch. Starch accumulation is fueled primarily by the above ear leaves, which receive the most sunlight once the plant is grown to full height, while the early growth of the plant was achieved by the below ear leaves, which become shaded as the plant grows.

The yield potential of a corn crop is related to its leaf area index, which is the one-sided green leaf area per unit of ground surface area. The leaf area index of a corn crop can be maximized by increasing plant population or by increasing leaf area on a per plant basis. Grain corn hybrids produce a maximum of 5-7 leaves above the ear, so these hybrids are planted at a high population of 33,000-36,000 plants per acre (ppa) to maximize their leaf area index. Leafy Corn Silage Hybrids have 8-13 leaves above the ear, so they have an increased leaf area on a per plant basis. This occurs as a result of the presence of the naturally occurring Leafy Gene. Because Leafies are larger plants, they need more room to produce their intended crop. To achieve this, they must be planted at a lower population to achieve a final stand of 28,000-30,000 ppa. Leafy Corn Silage Hybrids have an increased potential over non-Leafy hybrids to produce high starch yields on a per plant basis because of their high leaf area combined with their flex ear type.

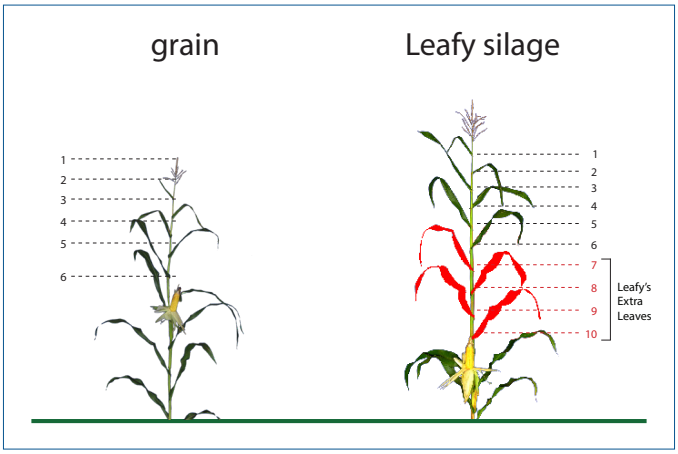


Figure 1

Figure 1 shows the typical stature of a grain hybrid and a Leafy Corn Silage Hybrid. Note the number of leaves above the ear (LAE), the size of these leaves and the position of the ear. The Leafy Corn Silage Hybrid has 10 LAE compared to 6 LAE on the grain plant. The four leaves highlighted in red just above the ear are the extra leaves on the Leafy Corn Silage Hybrid. This Leafy plant has 70% more leaf area above the ear than the grain hybrid and about 40% more total leaf area than the grain hybrid.

Comparing apples to apples

The dominant industry message is to plant all corn hybrids at high populations in order to maximize silage yield. While this advice is well-taken for grain hybrids, it is detrimental to a Leafy Corn Silage crop to plant it at the high populations recommended for grain. Table 1 below takes into account the higher leaf area of a Leafy Corn Silage Hybrid and compares that to the population density of a grain hybrid.

Leafy planted at	*is comparable to*	*Grain planted at*
25,000 ppa	x 40% more leaf area	35,000 ppa
28,000 ppa	x 40% more leaf area	39,000 ppa
35,000 ppa	x 40% more leaf area	49,000 ppa

Table 1: Leaf area comparisons at various final populations

When leaf area is accounted for, you can see that growing a Leafy Corn Silage Hybrid at 35,000 ppa gives a comparable canopy to the grain hybrid at 49,000 ppa. Growing the Leafy at 28,000 ppa gives the same leaf canopy as the grain hybrid at 39,000 ppa. To achieve the equal leaf area canopy as a grain hybrid that is planted at its recommended population of 35,000 ppa, the Leafy would be grown at 25,000 ppa.

Population affects yield

Leafies have been bred and tested since 1989. Since that time, numerous population studies have been conducted on the best hybrids. They have suffered hot dry seasons and major weather events with high winds and heavy rains. What has been discovered is that plants with 8-9 LAE achieve maximum yields at 30,000 ppa. For plants with 10-11 LAE, maximum yields result when they are planted at 28,000 ppa.

At 28,000 to 30,000 ppa, Leafy Corn Silage Hybrids have strong roots and good drought response. They also produce a crop with excellent feed qualities – high starch and a good proportion of digestible fibre.

Balancing yield with quality

When we plant a Leafy Corn Silage Hybrid, we are growing FEED that must be digested to produce milk or meat, so we aim to grow this crop at the population that will produce the highest quantity of dry matter with the highest starch content and best fibre digestibility, while achieving the best crop security. In our population studies, we have seen that in average conditions, the YIELD of a 10-11 LAE Leafy will not be different between 28,000 ppa and 32,000 ppa, and will often be less at 36,000 ppa. But when we look at the difference in the QUALITY of the feed that is produced at different populations, we see that maximum starch content and NDFd is achieved at the lower 28,000 ppa. For 8-9 LAE Leafy hybrids, this number is 30,000 ppa. Feed quality affects milk and meat production potential.

Figure 2 below illustrates the differences between the same Leafy Corn Silage Hybrid planted at 28,000 ppa and 35,000 ppa at the same location. At 28,000 ppa, the hybrid produced large ears and thick stalks. At 35,000 ppa the ear and stalk size declined. As the stalk size declines, so too does its digestibility.

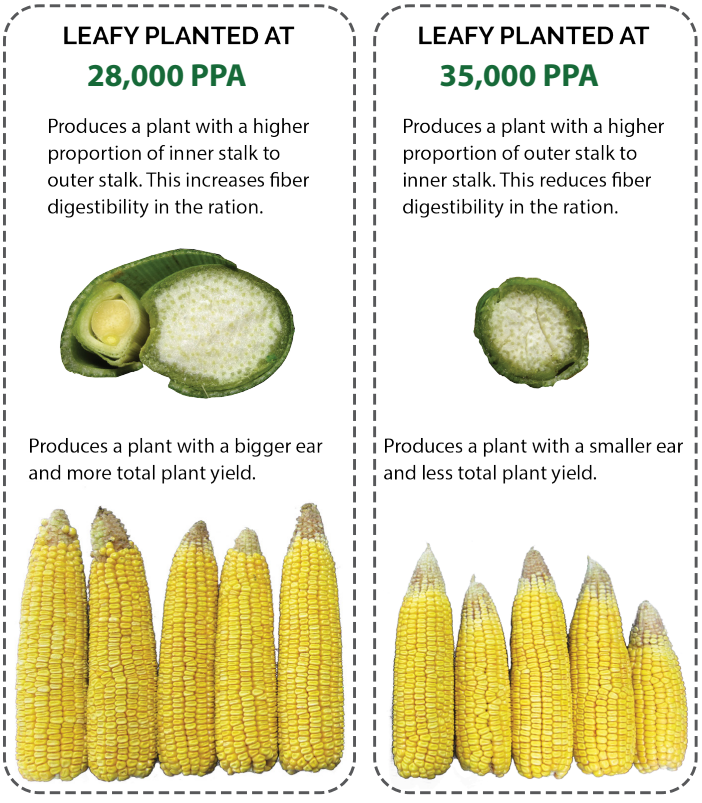


Figure 2

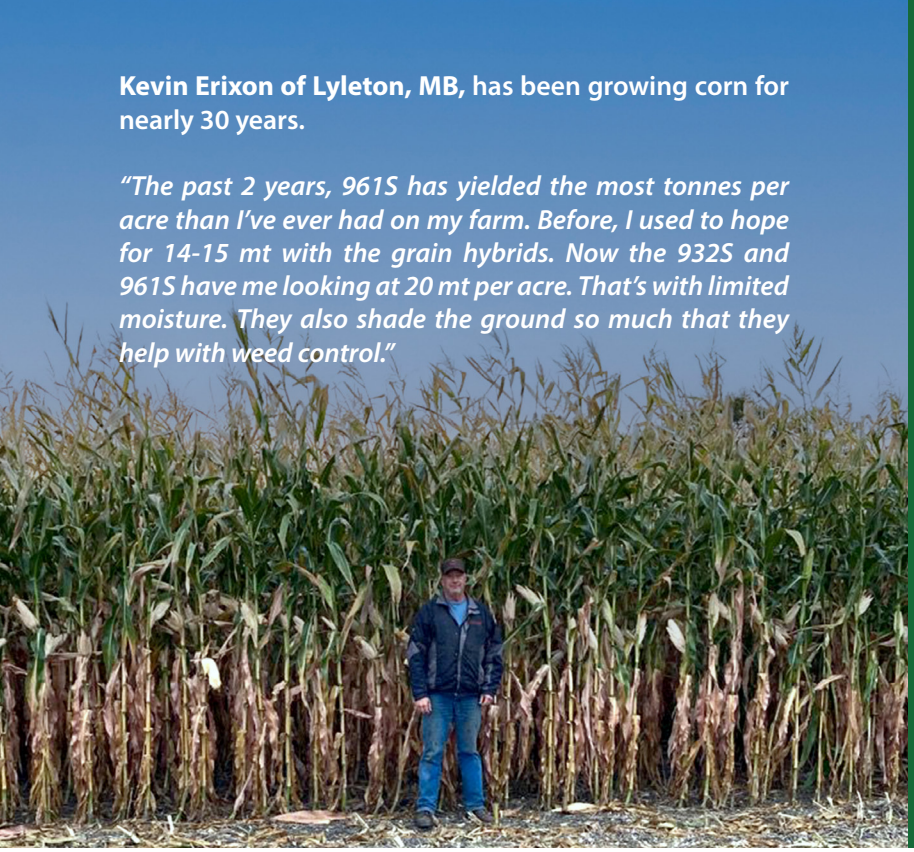
It is essential to grow Leafies at their intended populations. Increasing density can alter flowering dates and maturity, drought response, standability and overall plant composition, all of which affect the feeding value of the silage product.

Select the best corn silage for your operation

Selecting a corn silage hybrid based on its performance in head-to-head trials should be a no-brainer. Unfortunately, many of these trials are planted at populations that are much too high for Leafy Corn Silage Hybrids. As we know, when the Leafy is planted at a population of 33,000-35,000 ppa, it is comparable to planting a grain hybrid at 49,000 ppa. How would a grain hybrid do at 49,000 ppa? You have seen higher populations when the rows on headlands come closer together. Plants are thinner, ears are smaller, they mature more rapidly and if you look at the amount of grain in the whole plant community, it is much lower than where the rows are regularly spaced. The high population community has a low grain to stover ratio and the plants are very susceptible to drought stress, fertility stress, and root lodging. You would NEVER grow that grain hybrid at 49,000 ppa. In this type of trial, the data that is produced on Leafy Corn Silage Hybrids grown at 33,000-35,000 ppa does not reflect performance at their intended population.

In trials where the Milk 2006 formula is used to calculate milk per ton, the Leafy Corn Silage Hybrids show less starch and milk per ton, though they generally still have competitive yield per acre. In our trials, we grow dual-purpose hybrids at their recommended population of 35,000 ppa and Leafy Corn Silage Hybrids at their population of 28,000 ppa. In these population-sensitive trials, the Leafies show an advantage in yield, milk per ton and milk per acre, though starch digestibility is not accounted for.

Take our well-researched advice: grow your Leafy Corn Silage Hybrid at the population that will produce the largest quantity of high quality feed for milk and meat production – **a maximum final population of 30,000 ppa for 8 to 9 LAE hybrids and 28,000 ppa for 10 to 11 LAE hybrids, or at a rate of 10-20% less than a grain corn hybrid on the same acres.** All you need to do is change that planter population setting, and get the added benefit of buying less seed. When you plant a Leafy Corn Silage Hybrid, less is certainly more!



Kevin Erixon of Lyleton, MB, has been growing corn for nearly 30 years.

"The past 2 years, 961S has yielded the most tonnes per acre than I've ever had on my farm. Before, I used to hope for 14-15 mt with the grain hybrids. Now the 932S and 961S have me looking at 20 mt per acre. That's with limited moisture. They also shade the ground so much that they help with weed control."

LEAFY
CORN SILAGE

When you choose a Leafy, you plant 10-20% less seed to grow more digestible feed. At the lower population, you get as much or more yield than you would with a non - Leafy. That's a 10-20% savings on seed cost. You just can't do that with anything else.

NorthStar Genetics

WHEN THE GROWIN' GETS TOUGH, GET LEAFY

Leafy Corn Silage Hybrids are not invincible, but they outperform dual purpose grain hybrids in a tough season. These genetics deliver unique agronomics that will help you get the best feed in the bunker.

BOOST IN SPRING VIGOR: The seed of a Leafy has a semi-floury endosperm. This allows it to be more permeable to ground moisture for a **boost in spring vigor.**

MOISTURE EFFICIENT: These big plants have a **deeper root system** than non-Leafies, giving them **greater reach for moisture during a drought.**

STARCH SECURITY: A Leafy crop has a varied canopy height with some plants putting on a few more above ear leaves than others. Take a walk into a Leafy field at flowering time and you'll see the fertilization security that this characteristic offers, especially in a drought. While the tassels of a non-Leafy crop will flower all at once for about six days in good conditions, a Leafy crop will have a **pollen-shed window that is nearly double** that, with the shorter plants flowering first, followed by the medium and then the tallest. The key is that while the crop will vary in pollen shed timing, the ears throughout the field will produce silks at about the same time. In drought conditions the synchrony of the pollen and silking can be thrown off. **This wide pollen window brings much needed starch security at this sensitive time.**

WIND EVENT RESISTANCE: Leafies have a lower ear position on a more flexible stalk. This is ideal for producing digestible fibre, but it also gives the **crop resilience in a major wind event**. A Leafy is more likely to flex than to break.

FEEL THE FLEX: Leafies are **very responsive** to population. In areas where there has been poor emergence – due to flooding, for example, the Leafies that do come up are likely to put on multiple ears and **make good use of their available resources**.

EXTENDED HARVEST WINDOW: Leafies have been designed to **produce large ears with large, slow-drying kernels for increased starch digestibility**. The plants have also been designed to dry slowly and at a complimentary rate to the ear. These characteristics work together to extend the harvest window by about double the time of a non-Leafy. This means that a Leafy is more likely to make it into the bunker at its optimal growth stage when it is packable, fermentable and while the starch is naturally digestible. This translates to lower dry matter losses and better feed quality.

GROW, CHOP, FEED.

Make the most of these unique silage genetics:

Plant your LEAFY crop at no more than 30-32,000 ppa or at a seeding rate of 10-20% less than a grain crop in your area. At this population, you should expect maximum yield, best agronomics and optimal feed quality from your 924S, 928S, 932S, 951S and 961S. Plant your 913S at a seeding rate of 32-34,000 ppa, as it is not a Leafy. All seed should be planted at a 2 inch depth.

Isolate your 913S, 924S, 928S, 932S, 951S and 961S from other corn for maximum expression of floury kernels. Each of these products relies on the recessive opaque-1 gene to produce their floury kernels, and therefore requires self-pollination. A distance of 300 feet from other corn is ideal. If that's not possible, plant in wide blocks with short shared boundaries to reduce pollen contact between hybrid types, or work with prevailing winds by planting your Floury Hybrid to the west.

Do not mix 913S, 924S, 928S, 932S, 951S and 961S with a different hybrid type in the field because of differences in plant population, crop maturity, harvest window, required storage period and ration balancing.

We recommend a 3/4" chop length when harvesting. This will help to retain effective fibre in the ration and eliminate the need for wheat straw. The kernels will be relatively soft and available for digestion without aggressive kernel processing.

Do not harvest excess corn as grain as kernels are designed to be breakable. Use extra for high moisture corn, earlage or snaplage.

Store in a silo or bunker for a minimum of 30 days, or until fermentation is complete. Since starch is readily available, there is no need to wait for 5-6 months before feeding.

"The ears of the 932S and 961S don't drop to the ground, you really have to yank to get them off. Great for chopping."

Dallas Rowe from Coulter, MB.

Image: Chopping 961S at Seven Persons, AB

OUR FLOURY HYBRIDS ARE BUILT FOR CHOPPING

CHOPPING TESTIMONIAL:

Brandon Nemetz has been a custom chopper in Stettler, AB, for more than five years, and chops north of 3000 corn acres annually. Brandon is always relieved to hear when a customer is growing 913S.

"913S is a win/win for me and my customer. It allows us both to get through harvest without panicking, even with challenging weather. It stays in the 65% moisture range for so much longer than a dual purpose grain corn. If it's too wet, hot or windy, or if we get an early frost there can be problems, but 913S is a savior. After a frost event, I see grain corns turn white and drop from 70% to 50% moisture in 3 days, which makes it impossible to get everyone harvested in time. But I once chopped more than 1500 acres of 913S after a frost and none of it was under 60% moisture. Even in good years like 2023, the grain hybrids can die and dry very quickly. The flexibility that 913S provides with its wide chopping window is a game changer, and it means that everyone is getting better quality feed in the bunk."

"There are also other advantages to 913S. Unlike the grain hybrids, I don't see any 913S ears on the ground, even in the 30 degree heat. Its ears also get minimal bird damage due to its good husk coverage. And 913S is easier on my kernel processor. With some of the grain hybrids I have to tighten it to 1.25 or 1.5 mm to get a good chop. Even then, there are still little flecks and hockey pucks in the chop. With 913S, I can keep it at 2 mm or even back it off to 2 ½ or 2 ¾ mm and there are no pucks or balls in the sample. The kernels become a fine powder that's evenly distributed. I can get through the crop faster and with less fuel. It's a beautiful thing!"

WIDE HARVEST WINDOW

Corn silage that has a floury endosperm type gives the opportunity for an extended harvest window because kernels do not significantly lose starch digestibility as they mature. This increases the likelihood of harvesting a highly digestible silage product and translates to feed security. For the same reason, a higher level of starch accumulation beyond 50% milk line can be achieved without the loss of starch digestibility. Of course, it is essential to monitor plant maturity and ensure that the total plant remains within the harvest window so that good packing and fermentation is achieved.

SPEEDY HARVEST

The combination of softer stalks with the floury kernel type makes harvest a breeze. Dial back the kernel processor and speed-up a touch. You'll cover more acres with less time and fuel.

REDUCED INPUTS

Chopping a silage product with a softer kernel type allows for the retention of effective fibre in the silage product without sacrificing starch digestibility. This is achieved by reducing the aggressiveness of the kernel processor to the point that it cracks kernels into a few big pieces and maintains a recommended ¾" chop length. The longer chop length results in a corn silage product that has a higher content of effective fibre than one that has been chopped fine. Consequently, straw can be eliminated from the ration. The increased starch digestibility of these products also allows for the reduction of concentrate corn in the ration. If you're planting a Leafy, then you will also save on seed cost because of its lower seeding rate. Reducing inputs results in a savings in cost, storage space and effort for the operation.



Image: 913S at Watrous, SK

UDDERLY BETTER FEED

SMALL PARTICLE SIZE
Floury kernels fracture easily into small particles during silage chopping, allowing for a longer chop length (¾"recommended) and a short minimum storage period of 30 days. After chewing, the starch is readily available to the animal.

HIGH ENERGY STARCH
The small starch particles offer more surface area to rumen bugs for a boost in digestibility.

LONG RUMEN RETENTION
Floury starch particles may be more buoyant in the rumen and float to stay in the rumen mat for an extended digestion period.

RATION-TYPE ADAPTABILITY
Our Floury Hybrids are versatile. They can be balanced into various ration types to meet the nutritional needs of any cow group.

HIGH QUALITY MILK
Floury Hybrids have an increased potential to produce milk with high fat content. They do not require heavy kernel processing during harvest to reduce starch particle size, so fibre particles can remain large enough to act as effective fibre. This promotes normal rumination and saliva production, which plays an important role in protection from acidosis and increases milk fat content.

NUTRITIONIST TESTIMONIAL:

Nutritionists across the Prairies are becoming more familiar with NorthStar Genetics' Floury Corn Hybrids and the impact they have on dairy rations.

Adam Magarell of Nutrisource in Lethbridge, AB, has a lot of dairy clients using NorthStar Genetics' Floury Corn.

"The main benefit we observe is the consistency of the floury starch throughout the silage. There is less sorting by the cows and much better utilization of the starch by the cow. Most lab tests typically underestimate the starch content in a floury hybrid sample by 3-4%, however, the cows tell us that they are getting much better starch utilization. The consistency in the products, the milk and the butterfat are very good on a floury diet and the cows are very healthy."

"The second benefit is a direct result of the longer chopping window of NorthStar Genetics' Corn Hybrids. A cow can produce up to 10 lbs or 4.5 litres more milk from silage chopped at 65% moisture compared to 55% moisture. That's a big difference! Dual purpose grain hybrids are designed to dry down fast, and unfortunately, events such as a custom chopper not being able to get to the field in time, a mechanical breakdown, wet field conditions or a frost, can all cause the corn to pass through the ideal chopping window. It is great to have hybrids like 913S and 932S at our disposal that consistently stay in the 60-70% moisture range FOR LONGER."



Image: 913S at Ponoka, AB

THE BEST TEST: ANIMAL PERFORMANCE

We believe that the best way to see the difference in feed quality is to let your animals show you!

NorthStar Genetics' silage-specific products are dramatically different from dual purpose corn. When we submit samples to the lab, the results undervalue their quality relative to what is experienced by livestock producers who feed them to their herds. If you're not convinced, we recommend taking the following steps to perform an on-farm feed study to experience the scope of their benefits to your operation:

- Grow a minimum of 10-20 acres of the two crops (not just small strips), including your current corn hybrid and one of our NorthStar Genetics' silage-specific hybrids.
- Plant your hybrids at their recommended seeding rates, which may be different.
- Grow your floury product separately from other corn to get the maximum quantity of floury kernels.
- Chop and store your corn crops separately.
- To assess a silage crop, segregate your animals into groups, or switch your herd from one ration to another. Leave the other ration components the same.
- To assess a grazed crop, segregate the field, or separate the herd into two groups and graze the paddocks separately.
- Assess the results, whether it is in milk production quantity and quality in your dairy herd, or in pounds of gain and cow days of feed per acre for your feeders.
- **Your cows are the ultimate test and will tell you which hybrid is best!**



PUT IT TO THE TEST

Bart Bikker of Barrhead, AB, raised and silaged 20 acres of 913S, and performed a small on-farm feed study. The majority of his silage acres were composed of a dual purpose grain corn variety. The 913S was chopped and stored separately and produced enough feed for two weeks. The lab tests indicated that both corn silages were similar in quality, so Bart presented the cows with a ration that was identical except for the corn silage portion. The 913S silage was fed for the last week of October and the first week of November.

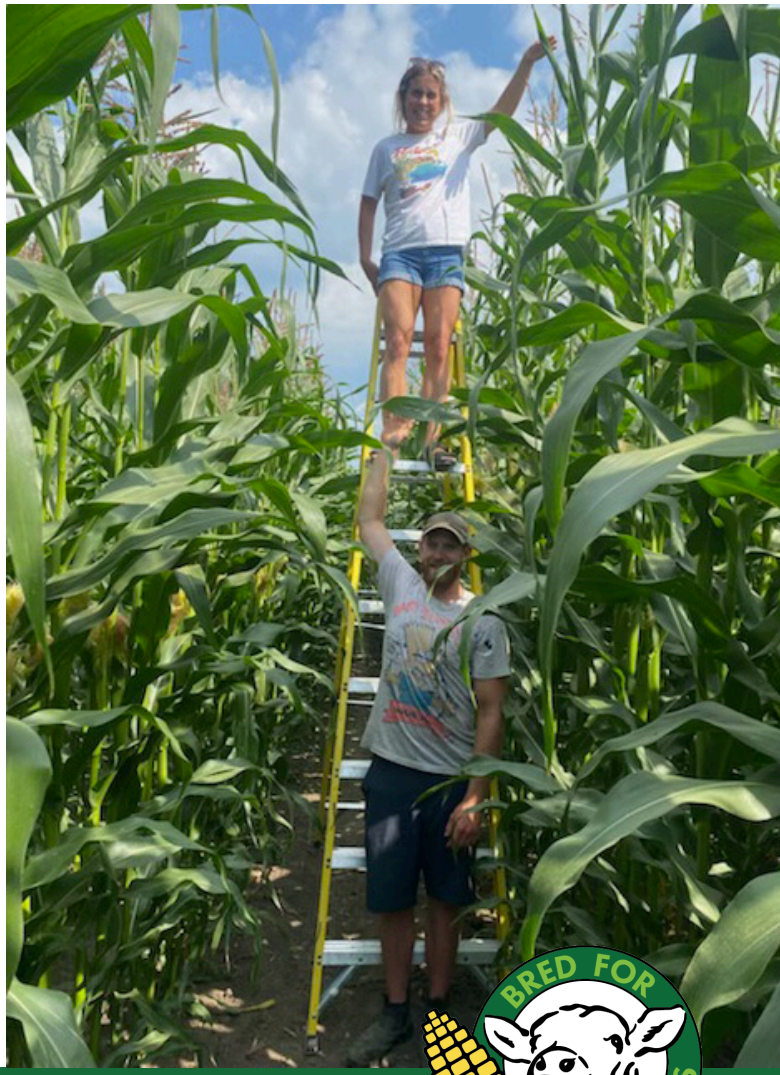
Date	Milk	Fat %	Total KG Butterfat Per Load	Corn Silage Type
Oct 6	14701	4.22	620.18	DP
Oct 8	14835	4.22	625.84	DP
Oct 10	14750	4.20	619.25	DP
Oct 12	14848	4.27	634.14	DP
Oct 14	14432	4.31	622.34	DP
Oct 16	14554	4.32	629.10	DP
Oct 18	14652	4.30	630.27	DP
Oct 20	14640	4.24	620.72	DP
Oct 22	14774	4.25	627.98	DP
Oct 24	14407	4.25	612.37	DP
Oct 26	**14652**	**4.30**	**630.34**	**913S**
Oct 28	**14652**	**4.38**	**642.42**	**913S**
Oct 30	**15142**	**4.32**	**654.53**	**913S**
Nov 1	**15178**	**4.22**	**640.40**	**913S**
Nov 3	**15043**	**4.27**	**642.52**	**913S**
Nov 5	**15312**	**4.22**	**646.03**	**913S**
Nov 7	15007	4.21	631.69	DP
Nov 9	14823	4.19	631.63	DP
Nov 11	14897	4.25	621.47	DP
Nov 13	14615	4.27	633.12	DP
Nov 15	15142	4.11	624.18	DP
Nov 17	14921	4.16	621.64	DP
Nov 19	14909	4.07	607.48	DP
Nov 21	14664	4.11	602.10	DP
Nov 23	15178	4.13	626.32	DP

Above: Milk results based on pick-up every other day. The only feed variable that changed in this time was the corn silage. *DP = dual purpose.
Top Left: Bart uses the SAMCO system to grow his 913s in Barrhead, 120 km NW of Edmonton.
Top Right: Shaved ears of the dual purpose hybrid (left) and 913S (right), which were the basis of Bart's rations.
Bottom Right: Maryje and Dakota Schutz in Bart's field of 913S. Maryje and Dakota also graze 913S on their own farm in Melville, SK.





"The cows went up 20 kg of butterfat per pick-up (642 kg) and dropped back to their original level (622 kg) after we switched back to regular silage. This additional 20 kg of butterfat every other day worked out to be $100.00 to $125.00 per day of extra profit. The cows ate roughly 5 tonnes per day, so that worked out to an incremental $20.00 to $25.00 of profit per ton of silage. 913S yielded 20 Mt at 65% moisture, well above the local average." Bart now grows 140 acres of 913S.



"THOSE "FREE" BAGS WOULD HAVE COST US"



Darcy and his son Andrew from Mason Farms Ltd., near Oak Point, MB, have been feeding 913S to their dairy cows for a few years. In 2024, they are growing exclusively NorthStar Genetics' silage hybrids, including 924S and 928S.

"Other corn companies will say there is no such thing as a true silage corn, but there is. Besides the longer harvest window that keeps the 913S greener longer, when you break open a kernel, you can tell the difference. On our dairy, we can see that NorthStar Genetics' silage corn makes better quality feed, which equates to better digestibility and better output. **After I switched my ration from 913S to a dual purpose grain corn, our butter fat dropped almost instantly from 4.2% to 3.9%. When 85% of your milk cheque is based on butterfat, that's a big difference.** *When we were offered a bunch of free dual purpose grain corn to try, we turned it down.* **Those "free" bags of grain corn would have COST us money!"**

BRED FOR YOUR COWS
NorthStar Genetics

NORTHSTAR GENETICS' FLOURY COB MEAL

Steven Boerchers of Optimal Dairy in Beausejour, MB, tried making cob meal from 932S last season. For years he had been buying grain corn and grinding it through his hammer mill to mix with the ration. He was tired of the added cost, and of seeing the hard, vitreous corn chunks come through in the manure. He wondered how his NorthStar Genetics' floury corn would do as an alternative, since he had already been feeding 932S as his silage. The results were impressive!

"I switched over to the 932S floury cob meal on Oct 11th and replaced all my purchased energy (wheat, barley and grain corn). I quickly saw the **daily production of milk increase from 38 kg/day to about 41 kg/day. It was great! I was able to produce the same amount of milk on just 131 cows instead of 152 cows. My butterfat indicator also increased from an average of 4.61% to 4.89% over the same period. And the corn meal in the manure was gone!"**

To get the job done, Steven attached a corn header onto his forage harvester and chopped the ears in mid-October, after the crop had reached black layer. He later returned for additional harvests in November and December, once he had seen the results. The chopped product came through the machine as a cob meal flour. He fermented it in a bag and mixed it into his ration with no additional processing.



Above: Kernel samples of a grain variety (left) and 932S (right). When milled, the grain variety fractures into chunks of vitreous starch, while the 932S becomes a fine powder.

Below: Ellen and Steven of Optimal Dairy



NUTRITIONIST TESTIMONIAL:

Matt Walpole is a Nutritionist and a Senior Consultant with DairySmart and BeefSmart. While he resides in southern Ontario, he consults with dairy and beef operations across Canada. Matt is thrilled that his clients are growing and feeding more NorthStar Genetics Floury hybrids to their herds.

"The total tract starch digestibility of NorthStar Floury hybrids is significantly higher than grain hybrids. This results in higher milk yields and improved calf weight gain. A big advantage is that the soft floury starch can be fed earlier in the fall than traditional grain hybrids. When one of my clients is teetering on whether to try one of these flouries, I tell them to plant at least one third of their acres to it. Then feed it from November to April, in the period before their grain hybrids are ready to be fed. Then they see the difference.

Matt sees the potential for floury hybrids to have other uses. Optimal Dairy was one of his first clients to try cob meal in Western Canada, but he has lots of clients that do it in Eastern Canada with great success.

"The NorthStar Genetics floury hybrids grow well and feed well – that's exciting."

THE PROOF IS IN THE PUDDING.



NorthStar Genetics' Grazing Approved Hybrids are bred for your cows, not for your combine.

Our Grazing Approved Floury Hybrids **913S, 924S, 928S, 932S, 951S** and **961S** are packed with the perfect balance of digestible starch and stover to feed your herd efficiently through our Western Canadian winters. They provide high yields of digestible starch even when they reach full maturity, and don't rely on the timely arrival of a killing frost to preserve starch digestibility. Their stalks are soft and edible all the way to the ground. What residue remains, snaps easily under foot and is less likely to hurt your cows' feet.

When compared to the dual purpose alternatives, we can see and touch the physical differences that impact herd performance. Refer to the images of a 72 DRM dual purpose grain hybrid and 913S at a similar stage of maturity. When we shave their kernels below the caps, we see the genetics at work. The kernels of the 913S are filled with soft, floury starch, while those of the dual purpose grain are filled with dense, vitreous starch.

When corn is left for winter grazing, many times starch has reached full maturity. Unlike a silage crop, grazing crops do not have the benefit of being chopped at an earlier stage of maturity and being processed into small pieces. Cows consume the product in its whole form. With a dual purpose grain, they often leave the tough lower stalk of the plants behind, which is both wasteful and can cause hoof injuries.

In examining the manure, we see the impact of kernel endosperm type on starch digestibility. The dual purpose manure sample contains a large quantity of undigested kernels, while the floury manure shows no visible kernel passage.

We have worked with numerous growers to compare the two product types. We typically find that our Flouries yield 1-3 Mt more per acre. Comparative lab analyses on chopped samples of these two product types tend to reveal that our Floury products contain

DUAL PURPOSE GRAIN HYBRID



Above: A mature ear of a 72 DRM dual purpose grain hybrid



Above: Manure from a cow that winter-grazed a dual purpose grain hybrid

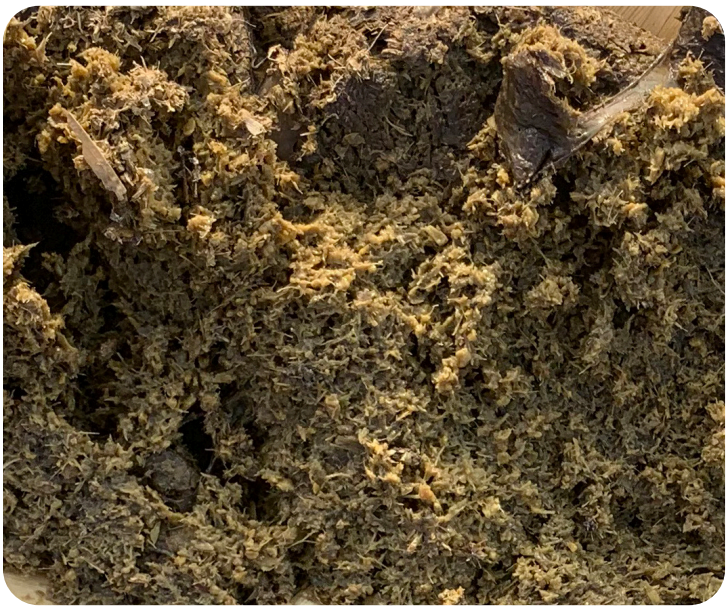


Above: Side-by-side plot of 913S and a dual purpose grain hybrid in late fall and in mid-winter at AIM plot, near Langham, SK

NorthStar Genetics 913S



Above: A mature ear of 913S



Above: Manure from a cow that winter-grazed 913S

the same amount of starch or a couple of points less starch than the dual purpose grain products. The fecal starch analyses typically tells us that manure from dual purpose manure samples contain 7-10% starch on average, while our Floury products contain only 0-2% starch. This represents a significant improvement in total tract starch digestibility of our Floury products when they are grazed.

When fed, herds demonstrate the benefits of NorthStar Genetics' Grazing Approved products in their satisfaction, health, feed efficiency and beef productivity.

We enthusiastically recommend these unique genetics for your herd's winter grazing needs!

GRAZING TESTIMONIAL:

Steven and Katie Cowan of Gainsborough, SK, have been grazing 300-350 acres of 913S for their 700 cows for the last four years. *"913S provides me great feed from December until the end of March, and less tractor time. My cows clean it up better, and I have had no trouble with acidosis since I switched to 913S. This year, we are also growing some 932S and are going to chop some for silage as well."*

Michael Jennings of Condor, AB, has a 350 cow/calf operation and is very impressed with 913S for grazing: *"It's unbelievable! Fecal analysis showed 99% digested starch after grazing, and 345 cattle days/acre… there is nothing else that I can grow that can give me that."*

"SHOW ME THE TONNES AND GIVE ME QUALITY!"

Kody Traxel and family of 'Traxel Ag Ventures' near Seven Persons, AB, feed 2000+ head in their family-owned feedlot. They have been growing NorthStar Genetics hybrids 932S and 961S for the last four years, and they now represent 80% of their corn acres. When it comes to the corn varieties that they grow for feed, Kody wants two main things:

SHOW ME THE TONNES

"Our main focus is to have the bunkers full! The silage is our money maker, and we can add more distillers grains to balance the ration if need be. With that said, the leafy varieties have done nothing but impress on the balance sheet of feed quality! Last year was a prime example, leaving us with an overstock of additives that we thought we needed to get the job done in that feed season!"

"NorthStar Genetics Leafies 932S and 961S are massive tonners. We've seen 961S over 14' tall. It's so big that one year, the chopper had to stop when it got dark because he couldn't see anything through all the massive cobs and green leaves. And 932S has huge Freakin' Cobs! They're the size of my arm!"

Kody knows that these varieties don't just look great, they deliver. "We weigh every load of silage into the pit, and everything going out. Last year 961S yielded 25.8 mt/acre in the pit. It beat the dual purpose grain hybrids by more than 4 mt an acre."

"I custom plant, custom chop, and have my own feedlot. I've never seen anything grow and stay green like NorthStar Genetics' Floury Leafy Corn. IT IS A TRUE SILAGE CORN."

Greg Trewin – Trewin Livestock, Coulter, MB

GIVE ME QUALITY

The cattle need quality feed to maximize their average daily gain. "Better gain per day means less cost to feed for my clients and more money in my pocket."

"932S and 961S have an incredibly open chopping window. I have noticed that as my NSG acres grow, my silage shrinkage in the bunk reduces. I don't think that's coincidence, as they go in the pit with tremendous colour and moisture. My nutritionist couldn't get over the silage quality as well! 932S and 961S make unbelievable quality silage, as the kernel cracking is excellent, and the silage is uniform, consistent and has lots of energy. Our average daily gain is amazing. We base our feeding ration for our grassers and breeding quality heifers on a 1.8 lbs diet, and last year we were obtaining 2.5-2.6 lbs per day gain! That's a great number when converting back to cost per gain! I was also able to reduce the amount of DDGs and grain I was feeding, which is a big deal for us at our feedlot, since I have to buy all my additives third party. Silage is the only source I produce. If I can use silage that I produced on my own operation to replace some grain, that's money in the bank."

BONUS

"An added bonus is the reduced planting rate. The leafy plants are big and the flex ear does it's job, so growing more tonnes with less input cost is music to my ears. In our trials it's proven that reducing the planting population on our 22" rows has increased yield and profitability!"



Image: Poplar Lodge, Czar, AB

"YOU CAN'T EVEN START TO COMPARE THE DIFFERENCE"

Logan Kristjanson has been grazing dual purpose grain corn for years on his 220 Cow/Calf operation near Foam Lake, SK. Although his crops were tall and gave him 200-225 cattle grazing days per acre, he was frustrated by the lack of leaves in the winter and the quantity of kernels in the manure. The stalk residue that was left in the field would require two or three operations in the spring to prepare the land for planting.

In 2022, Logan trialed 913S with good results. He converted his whole farm to 913S for the 2023 season, and sure was glad he made the switch:

"Although there wasn't that much difference in plant height, you can't even start to compare the difference in all aspects between 913S and the competitor."

After a few days of adjusting to grazing corn, Logan noticed no kernels in his herd's manure. The stalks were so palatable and digestible that *"the cows mowed the crop right to the ground"*. And 913S kept its leaves. That season, his cattle grazing days went through the roof with 350 cattle days per acre, significantly more than he had ever experienced. He had so much feed left over that he bailed 30% of his acres!

"913S is unmatched for ease and convenience because of its excellent cleanup. Come spring, there was very little stalk residue. I was able to do a quick harrow, put in some NH3 and plant right into the corn stubble. I've got my whole farm in 913S again this year."



Above: 913S at Balmoral, MB, with a full canopy

Below: Competitor dual purpose grain corn residue at Foam Lake, SK



Below: 913S at Foam Lake, SK, mowed by the cows



"THE COWS ARE MORE CONTENT"



Image: 913S at Big River, SK

Robin McCrea of Robanna Farm in Baldwinton, just west of Cut Knife, SK, and his family have been growing corn for their 300 head cow/calf operation for over 20 years. *"Growing corn has saved our operation especially in the severe drought years of 2002 and 2021, when no other crop could produce tonnes to feed our herd."*

"Four years ago, when I was approached to grow NorthStar Genetics' 913S, I responded that it would have to prove itself. I am a numbers guy. I also have a 10,000 acre grain farm, so I like to test new genetics and see what's working, and what's not. The first year, I grew a few acres. We liked what we saw - a big, tall plant with a nice ear. The cows ate it up, so we decided to try a 40-50 acre field the next year. 913S did well again. I noticed it didn't quite have the protein and starch percentage of some of the grain corns, but my cows were doing well and looked very healthy. Erik, my hired man, kept reminding me that ***THE COWS ARE MORE CONTENT*** *in the NorthStar corn. They were not pushing fences and were cleaning the corn right up. The palatability was amazing, and there were no kernels in the manure. We kept increasing our acres and are now full farm NorthStar Genetics. This year in addition to our 913S, we are trying some 924S to incorporate some Floury Leafy corn into the grazing blend. We will see what the cows have to say about that! "*

HORSE HIGH BY THE 4TH OF JULY!

Jeremy Farmer of Quesnel, BC, has been grazing his 500 cow/calf pairs on 913S since 2021.

Although many ranchers want their corn to be at least knee high by the 4th of July, in 2023, Jeremy's 913S was horse high by the 4th of July, and ultimately yielded 400 cattle grazing days per acre. Jeremy calculated that it cost about 70 cents per cow per day to feed his herd, including the expense of seed, fertilizer and planting. *"No other feed source can touch that."*

913S also maintained its digestibility even when it reached full maturity. *"Due to the heat this past year, I was grazing my 913S after black layer. It was great to see very minimal corn in the manure. I wouldn't have had that same experience grazing a dual-purpose grain corn hybrid! Overall I am very happy with 913S!"*



Image: Jeremy Farmer and his horse Fancy, with 913S

BRED FOR YOUR COWS
NorthStar Genetics

NORTHSTAR GENETICS' CORN IS NOT JUST FOR COWS.



Ken and Iris Overby from Inwood, MB, have been growing corn to feed their bison for the last 4 years.

"2023 was our first year growing NorthStar Genetics' 913S silage corn and it was awesome. It was a phenomenal year. We had between 15.7 and 16.1 mt at 44% moisture, which is equal to 23.6 mt at 65% if we had taken it for silage. Our first herd of 101 head (57 cows/bulls and 44 calves) grazed 21 acres at a final cost of $0.85 per bison per day, and our second herd of 135 head (75 cows/bulls and 60 calves) grazed 38 acres at a cost of $1.14 per bison per day. You can't find any other feed source for bison that cheap. Thankfully we don't have to move fences like they do for beef cows, so there's little cost for maintenance. Corn, specifically 913S, is a perfect fit."



Image: Bison feeding on 913S in Inwood, MB

"WHY DON'T YOU FEED IT TO YOUR SHEEP AS WELL?"

Lori and her husband Tyler from Melfort, SK, raise 150 ewes and have been growing corn for several years to feed their 40 beef cows. When she was asked by her NorthStar Genetics rep, *"Why don't you feed it to your sheep as well?",* Lori thought he was crazy... but she decided to give it a shot.

"Two years ago, we did a test. We took a few ewes and put them in a small area of 913S. Although the sheep appeared daunted by these massive plants, they settled-in to nibbling at the edges of the field, so we left them overnight. The next morning, I was astonished to see that almost 75% of the corn was gone, and it didn't take long before the whole area was flat as a tabletop. The sheep loved it!"

Unlike beef cows, sheep will only eat the corn when it is green and not completely dried down in the winter. Lori typically grazes the sheep from September until the end of October. After the sheep are done, they turn their beef cattle into the rest of the field.

"In 2023, we didn't have a lot of rain, but 913S still grew to 8-10 ft high and yielded well. We were able to feed 75 ewes on about two acres for six to seven weeks. We don't track many metrics, but there was no corn in the manure, and the sheep were very healthy. We also had a great run on triplets and twins. Grazing 913S gives our operation an easy six weeks. It keeps the manure out of the yard for the two months when the pastures are generally done. It's a good fit for our farm!"





Images: 913S Before and after being grazed by ewes in Melfort, SK

10 WAYS TO BOOST YOUR BOTTOM LINE

NorthStar Genetics' silage-specific hybrids deliver increased income over feed costs in sophisticated ways. The key is in the synergy between their silage-specific characteristics.

1 **MAXIMIZE TONNAGE**
NorthStar Genetics' silage-specific hybrids tend to produce 1-3 Mt more yield per acre compared to dual purpose hybrids, when planted at their respective recommended populations.

2 **PLANT 10-20% LESS SEED**
Plant your Leafy at a reduced population to achieve a final stand of 28,000-30,000 ppa to produce its optimal silage crop. You typically need to plant a non-Leafy at 35,000 ppa to get its best yield.

3 **MAXIMIZE YOUR HARVEST WINDOW**
You're more likely to chop and store your best feed and avoid added costs of trying to salvage silage that was harvested too dry. NorthStar Genetics' silage-specific hybrids dry slowly for silage security.

4 **CHOP FASTER**
Our silage-specific products produce large, moist kernels that are designed to break-up during chopping. Ease off on the kernel processor to speed-up harvest. You'll save fuel and retain effective fibre.

5 **REDUCE STORAGE SPACE BY 25%**
The soft starch of our products can be fed as soon as 30 days after harvest, or as soon as fermentation is complete. That's five months sooner than dual purpose hybrids. You'll need less silage on hand and that frees up a lot of space.

6 **ENJOY HIGH PRODUCTIVITY**
NorthStar Genetics' silage-specific products produce high quantities of high quality milk. They also support efficient weight gain for beef production when fed as silage or when grazed.

7 **REDUCE KERNEL PASSAGE & SORTING**
Our silage-specific products have digestible kernels. More starch is used as fuel, and because it fractures into small particles, it is less likely to be sorted during feeding.

8 **REDUCE ADDITIVES**
The increased digestibility of our silage-specific products allows for a reduction in additives such as concentrate corn and palm oil, and you will not need to add straw to gain effective fibre.

9 **MINIMIZE DRY MATTER LOSSES**
A shorter required storage time can reduce dry matter losses and help retain silage quality. Lose less, feed more.

10 **INCREASE 3.5% FAT CORRECTED MILK**
In feed studies, Floury Leafies have been shown to produce milk with a higher percentage of fat than dual purpose and BMR hybrids.





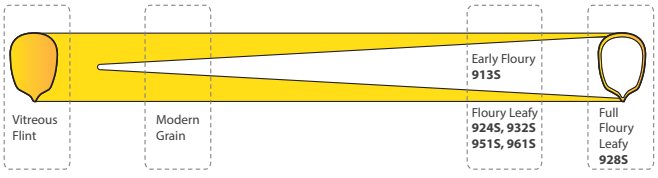
THE VALUE OF FLOURY

The History and the Science. By Margo Lee, Plant Breeder, Glenn Seed Ltd.

Floury and Floury Leafy Corn Silage Hybrids have been grown and fed on dairy and beef operations for decades. In this time, we've learned a lot and are taking stock of what we know about the value of their more floury endosperm type in animal nutrition. We have reviewed and compiled studies using our Leafy and Floury Leafy Corn Silage products as well as lab tests that we have commissioned using our genetics. We have also turned to the literature from the dairy science community that has assessed how corn endosperm type affects starch digestibility in cows, though most of these studies have been conducted on genetic sources other than the opaque-1 gene that is responsible for our floury.

What is our floury starch and how is it genetically different from the starch of our Leafies and dual purpose hybrids?

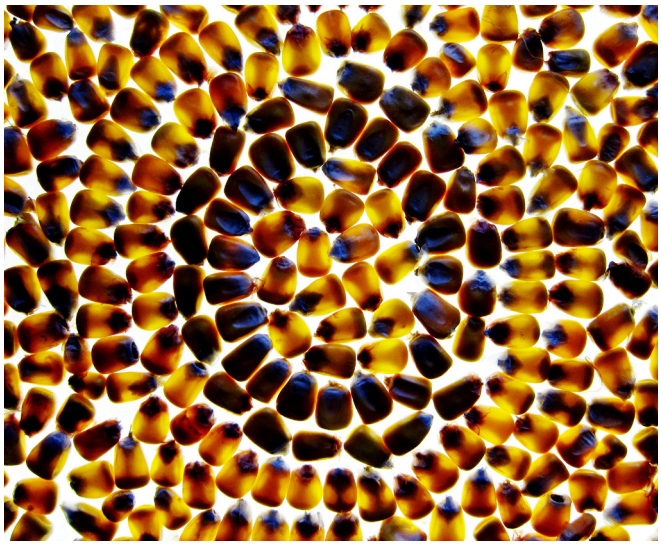
Let's get back to basics. The corn kernel is made up of three main parts: the pericarp, germ and endosperm. The endosperm contains the starch, and starch can be floury; appearing white and powdery, or vitreous; appearing yellow and glass-like. When viewed on a light table, vitreous starch transmits light and glows, while floury starch absorbs the light and appears dark. Both genetics and stage of kernel maturity affect starch type, and most kernels combine vitreous and floury starch in different ratios.



Above: Endosperm type diagram: illustrates a range of kernel starch types from vitreous to floury.

In the pursuit of increasing starch digestibility, our **Leafy Corn Silage Hybrids** have been bred to produce ears that have soft, slow drying, dent type kernels. Their kernels have been selected to be large and to contain a higher proportion of floury starch than grain-bred hybrids. These characteristics combine to increase the breakability of the kernels and to reduce the particle size of the broken starch in the chopped corn silage product to make it more available to the cow.

Our **Floury** products produce an ear with two distinct kernel types. Seventy-five percent of the kernels on their ears are like those of our Leafy products. The other 25% of their kernels are floury as a result of having the recessive opaque-1 gene in one parent of the hybrid. The floury kernels are composed of a very thin layer of vitreous starch that surrounds the outer parts of the endosperm. This layer is approximately 0.2mm thick. The rest of the starch



Above: Floury and vitreous kernels on a light table. Floury kernels appear opaque and vitreous kernels glow.

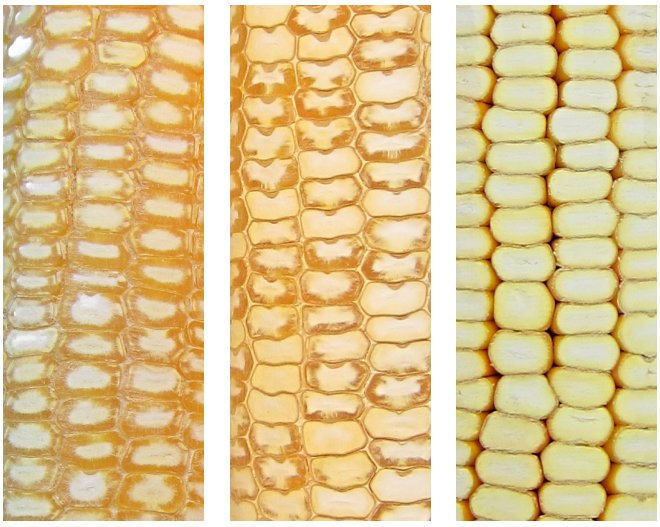
in the endosperm is white and powdery. Even as kernels reach full maturity, they pack in more floury starch and never deposit more vitreous starch.

Our **Full Floury** products contain the opaque-1 gene in both parents of the hybrid, resulting in 100% of their kernels being floury when self-pollinated.

The opaque-1 gene is recessive. For this reason, our Floury and Full Floury hybrids must self-pollinate. If they are pollinated by other corn, their kernels will become vitreous because the opaque-1 gene will be suppressed. These products should not be mixed in the same field with other corn hybrids if floury kernels are desired.

How can a more floury corn silage product be beneficial to a livestock operation even before it reaches the cow?

Choosing a corn silage product with a softer endosperm type has far-reaching benefits that go beyond the boost in starch digestibility that is realized when it is fed. Many of these benefits fall outside the scope of feed studies and cannot be measured by a lab test. For example, corn silage that has a softer, more floury endosperm type gives the opportunity for an extended harvest window because kernels do not significantly lose starch digestibility as they mature. This increases the likelihood of harvesting a highly digestible silage product and translates to feed security. For the same reason, a higher level of starch accumulation beyond 50% milk line can also be achieved without the loss of starch digestibility. Of course, it is essential to monitor plant maturity and ensure that the total plant remains within the harvest window so that good packing and fermentation can be achieved.



Dual Purpose **Floury Leafy** **Full Floury Leafy**

Above: Ears have been shaved to reveal endosperm composition.

Chopping a silage product with a softer kernel type also allows for the retention of effective fibre in the silage product without sacrificing starch digestibility. This is achieved by reducing the aggressiveness of the kernel processor to the point that it cracks kernels into a few big pieces and maintains a recommended ¾" chop length. The longer chop length results in a corn silage product that has a higher content of effective fibre than one that has been chopped fine. The retention of effective fibre helps the rumen function normally and boosts milk fat production. Consequently, this should allow for the elimination of straw from the ration, which is a savings in cost, storage space and effort for the operation.

Once in the bunker, the floury silage product can be fed after 30 days since the starch is readily available. This will save on bunker space and dry matter losses. In addition, concentrate corn can be reduced in the ration to reflect the increased starch digestibility of the silage product.

These often overlooked benefits of a genetically floury corn silage product can add up to savings in time, money and space for the operation. It can also increase feed security and result in a higher quality feed product. These advantages can have a significant impact on the operation's bottom line when the floury silage product is managed accordingly.

> *"Greater starch digestibility results in increased energy availability for dairy cows and thereby greater milk production, feed efficiency, or both"* (Ferraretto et al., 2015)

How does endosperm type affect starch digestibility in cows?

The topic of variation in starch type and its relationship to starch digestibility has been moderately explored by ruminant researchers. Several studies have used other sources of germplasm to support the conclusion that increased vitreousness of corn starch has a negative effect on starch digestibility in cows (Phillipeau, 1998; Correa, 2002; Lebaca, 2007; Ngonyamo-Magee, 2008; Allen, 2005, 2008, 2012). Despite this conclusion, some of the researchers indicate that the impact of these findings on industry have been limited because of the lack of commercially available products that combine the floury endosperm type with yield and agronomics [Lebaca (2007), Ngonyamo-Magee (2008)].

In 2008, Ngonyamo-Magee published a study where he and his team assessed a wide range of inbreds with various endosperm types ranging from floury to very densely packed flint types. They harvested starch samples at 50% milk line and at black layer. Samples were



Above: A Floury Leafy Corn Silage Hybrid being chopped

dried at 40 degrees Celsius and ground with a Wiley mill with a 6mm screen. They then did various *in situ* and *in vitro* tests on the samples and concluded that "[v]itreousness had strong negative correlations with degradability, particularly for more mature samples…" Of the 33 inbred lines that he compared in this study, there were two floury types, one containing the fl2 gene and the other containing opaque-2 gene. These two flouries had the highest ruminal dry matter degradability.

In 2005, Allen did a feed study that compared a floury to vitreous concentrate corn. The two grain types were added to multiple ration types and fed. He found that "[r]ate of ruminal starch digestion was faster and rate of ruminal starch passage tended to be slower in diets containing corn grain with floury vs. vitreous endosperm, resulting in a mean increase of 22 units for ruminal starch digestibility." He saw that "starch entering the duodenum was more digestible for grain with floury endosperm compared with vitreous grain, resulting in greater total tract starch digestibility," and that "vitreous corn grain fermented more slowly and passed from the rumen faster, resulting in decreased ruminal starch digestibility." He concluded that "[e]ndosperm type of corn grain greatly influences site of starch digestion and should be considered when formulating diets."

In a study where Allen fed cows floury and vitreous dry ground corn kernels, he found that regardless of the grind size, the floury was more digestible than the vitreous. He concluded that "endosperm type greatly affects ruminal and total tract starch digestibility independent of corn grain grind size" (2008). In a 2012 study, Allen found that "processing corn silage is not as effective at increasing surface area as fine grinding; processing can reduce, but not eliminate, differences in digestibility of sources varying in vitreousness". In short, even when finely ground, vitreous grain is not as digestible as a floury grain, and when it comes to silage, an aggressively processed vitreous grain hybrid will not have as much starch digestibility as a hybrid with a floury kernel type.

Does the more floury endosperm type of our commercial products affect starch digestibility in cows?

The increased starch digestibility of our Leafy and Floury Leafy Corn Silage Hybrids has been documented by researchers since 2001 in both lab testing and in academic milk studies.

In 2012, Agriculture and Agri-food Canada published a study comparing two dual purpose hybrids to two Leafy hybrids over four seasons. They found that the Leafies had significantly higher kernel moisture than the dual purpose hybrids in each of the four years as well as a higher maximum kernel dry weight in two of the four years. They concluded that "[t]he softer kernels in Leafy silage-specific hybrids indicate that under the same ensiling conditions, there would be more digestible energy produced from kernel starch than from non-Leafy dual-purpose hybrids." (Dwyer &Ma, 2012).

In feed studies that compare Leafies to dual purpose hybrids, it is common to see the following pattern: The dual purpose silage product contains a few points more starch than the Leafy, but the Leafy's starch is softer and more digestible. When fed the Leafy ration, cows produce more milk with increased milk solids over the dual purpose ration. (Thomas et al., 2001; Bal et al., 2000; Clark et al., 2002). We see about 6% more starch digestibility *in situ* from a Leafy compared to a dual purpose (Bal et al., 2000) and about 12% more starch digestibility *in situ* from a Floury Leafy compared to a BMR, which has a vitreous grain-style kernel (Ferraretto et al., 2015).

In 2015, the University of Wisconsin published a milk study that compared a Floury Leafy Corn Silage Hybrid to a BMR. Researchers found that "the starch portion of the LFY was more digestible than BMR as observed by ruminal *in vitro* and *in situ* starch digestibility coefficients". They found that the Floury Leafy had a "10 percentage unit greater ruminal *in situ* starch digestibility coefficient (12h)… compared with BMR." They also found that "kernel vitreousness was more than 2-fold greater for BMR than LFY (90.0 vs 37.5%)" and that "starch digestibility of the BMR was inhibited by vitreousness."

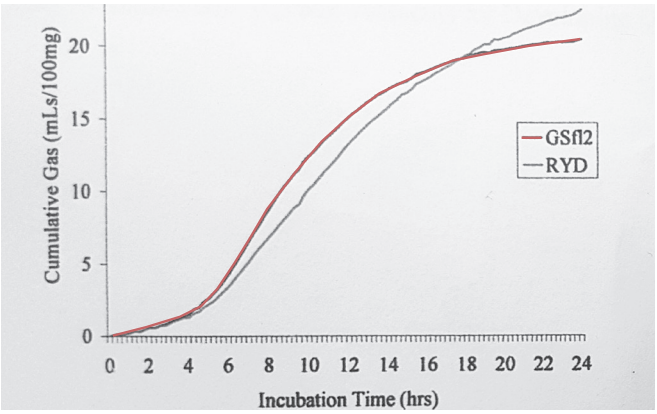
The researchers indicated that the Floury Leafy ration had the same feed conversion as the BMR ration and it produced milk with a higher concentration of fat. "[M]ilk fat content was greater for cows fed LFY (4.05%) than BMR (3.83%)". In addition,"total-tract starch digestibility was greater for cows fed the LFY corn silage." (Ferraretto et al., 2015)

How does the starch of our Floury Leafies compare with other corn starch types?

A key part of our research program has always included third party testing of our products. Over the years, we have worked with many of the major North American labs and dairy research institutions to apply their latest testing procedures to our products, as well as to inform them of the innovations in our breeding program. We have asked researchers to assess the starch digestibility of our floury genetics in many ways.

In 2018, we sent grain samples of our floury kernels to Dairyland Labs so that they could assess the differences between it and a vitreous kernel type. They performed IVSD (*in vitro* starch digestibility) testing on both samples. Samples were ground to 4mm and a 7hr test was performed. The floury kernels were found to have 55.8% starch digestibility and the vitreous corn had 45.2% starch digestibility. This is a 10.6 percentage point boost for our floury corn. They also did *in vitro* gas testing on both samples for a period of 48 hours. At the seven-hour mark, the floury grain had produced 22% more gas than the vitreous grain.

In 2012, we submitted a sample of our floury grain to the University of Wisconsin, where they compared it to Reid's Yellow Dent (RYD), a relatively vitreous kernel type, in order to explore differences in quality between the two endosperm types. Research was conducted by S. Nellis at UW Madison, Department of Dairy Science. Nellis indicated that the floury sample was 75% opaque while the vitreous sample was 25% opaque. Nellis ground the two samples with a Wiley mill set to 4mm and found that the floury sample ground to finer particles than the vitreous sample. The samples were subjected to an IVSD test. Over the 24-hour testing period, the two samples were found to have a similar total degradation, but at the 7 hour mark, the floury kernels had produced much more gas. Nellis concluded that the Floury "nutrients were more readily available to the rumen microorganisms as seen in a faster initial rate of fermentation."



Above: Cumulative gas production (mLs gas/100 mg sample) over time for the floury kernels (GSfl2) and RYD. (Nellis, 2012)

What we've learned

The results of this research are encouraging. We know that studies assessing our germplasm have found evidence of greater *in vitro* and *in situ* ruminal and total tract starch digestibility associated with their more floury endosperm types. Several researchers in the dairy science community have come to the same conclusion by examining other sources of floury endosperm corn. They have concluded that a more floury corn endosperm type reduces starch particle size and increases ruminal and total tract starch digestion.

When we add to this the additional benefits of an extended harvest window in which greater starch accumulation may be achieved in the silage product, the maintenance of effective fibre, the reduction of ration additives and the shortening of required storage time, we begin to see the tremendous contribution that these products can make to the livestock industry.

While this article has focused on starch type and the power of improved starch digestibility, it is essential to remember that corn silage is a forage product. Starch is but one important piece of the equation. A floury endosperm type is only of value to the silage producer if it comes as part of a hybrid package that combines silage agronomics, quality fibre and high yield. The good news is that our products have been bred and tested for these characteristics as well.



Above: Cows eating a Floury Leafy Corn Silage ration

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Image: NorthStar Genetics Plot in Fabyan, AB

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early FLOURY CORN SILAGE

floury LEAFY CORN SILAGE

full floury LEAFY CORN SILAGE

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