White Clover's Role in Pastures

NovaGraz™ Herbicide

Whitepaper

NovaGraz™

HERBICIDE

CORTEVA™ agriscience

Range & Pasture™

Visit us at **rangeandpasture.com**

NovaGraz™ Herbicide

Take Out Weeds, Leave White Clover

The clover conundrum ends: You no longer have to sacrifice white clover to control broadleaf weeds in a pasture.

Clover in a cool-season grass pasture can be such an economic benefit that producers hate to risk losing it. But when broadleaf weeds invade, forage yield suffers and the overall quality of the pasture can decline.

Until now, pasture herbicides couldn't take out most broadleaf weeds without also removing white clover and annual lespedeza. That changes with NovaGraz™ herbicide.

Now produce clean pastures with all the benefits of white clover and annual lespedeza growing with the grasses.

Those benefits include both improved forage quality for better animal performance and improved soil fertility due to the nitrogen-fixing capability of legumes.

Without effective broadleaf weed control, the harm weeds cause to forage production and pasture quality can outweigh the benefits legumes provide.

NovaGraz herbicide is a breakthrough in pasture management.

NovaGraz herbicide is a proprietary formulation of chemistry from Corteva Agriscience. NovaGraz is the first broadly effective herbicide to control broadleaf weeds while preserving white clover and annual lespedeza.

Multiple years of testing show NovaGraz provides broader-spectrum control of broadleaf weeds compared to 2,4-D alone. Among the species NovaGraz controls are:

- Ironweed
- Cocklebur
- Wild carrot
- Buttercup
- Biennial thistles
- Ragweeds
- Plantain
- Woolly croton
- Poison hemlock

Among the product features, NovaGraz™ herbicide:

- Controls a broad spectrum of weeds in permanent grass pastures, rangeland, hayfields and Conservation Reserve Program (CRP) acres.
- Preserves white clover and annual lespedeza for an abundant, diverse, high-quality forage that improves livestock production.
- Maintains desirable forages that mowing would remove while also offering weed control.
- Provides effective, broad-spectrum weed control where a nonresidual option offers flexibility.
- NovaGraz™ herbicide is the first broadly effective tool to control broadleaf weeds while preserving white clover and annual lespedeza.

What About Red Clover?

Red clover varieties are more sensitive to NovaGraz™ herbicide than white clover or annual lespedeza. The herbicide may kill red clover. NovaGraz is not recommended for pastures where managers want to keep red clover.

Reap the benefits of white clover in pasture.

The benefits of white clover are well established. Like most legumes, white clover obtains nitrogen (N) from the air and fixes it in the roots via special bacteria. Some of that N ultimately becomes available to grasses growing with the clover.
The amount of N fixed per acre will vary, but studies generally show that white clover fixes 100 to 150 pounds of N per acre per year. Commercial N prices have varied considerably in recent years. But if N from a spreader costs $0.55 per pound, just 100 pounds of N fixed by white clover represents a value of $55 per acre per year. **See Table 1.**

Table 1. Value of Nitrogen (N) Fixed by White Clover

	N Value				
N Fixed lb. / A / Yr.	35 ¢/lb.	45 ¢/lb.	55 ¢/lb.	65 ¢/lb.	75 ¢/lb.
75	$ 26	$ 34	$ 41	$ 49	$ 56
100	$ 35	$ 45	$ 55	$ 65	$ 75
125	$ 44	$ 56	$ 69	$ 81	$ 94
150	$ 53	$ 68	$ 83	$ 98	$ 113

Source: Adapted from Southern Forages, 2007, 2015

White clover in the forage mix improves forage quality. Compared to perennial grasses, legumes are generally higher in crude protein and several minerals and vitamins. They're also higher in digestibility.

Because legumes are digested more rapidly, they tend to stimulate an increase in intake. The animal consumes both more and higher quality forage. That improves animal performance — greater average daily gains and higher conception rates.

White clover can serve a role in improving animal health. It does that by offsetting various livestock disorders associated with grazing some forages. Where cattle graze toxic endophyte-infected (E+) tall fescue, adding legumes is the most common strategy to alleviate fescue toxicosis.

In a two-year Alabama trial, researchers compared the performance of stocker cattle grazing E+ pastures with and without white clover. The presence of the legume consistently improved growth rates. White clover in the pasture raised average daily gains by 44% and stocker gains per acre by 55%. See **Table 2**.

Table 2. Performance of Steers Grazing Endophyte-Infected Tall Fescue with and without Ladino Clover in North Alabama, Two-year Average

Pasture	Daily Gain lb. / Steer	Total Gain lb. / Steer	Total Gain lb. / A
Fescue + Ladino Clover	1.53	307	582
Fescue + Nitrogen*	1.06	203	374

*150 lbs. N Per Acre Per Year | Source: Hoveland, et al., Alabama Agric. Exp. Stn. #530

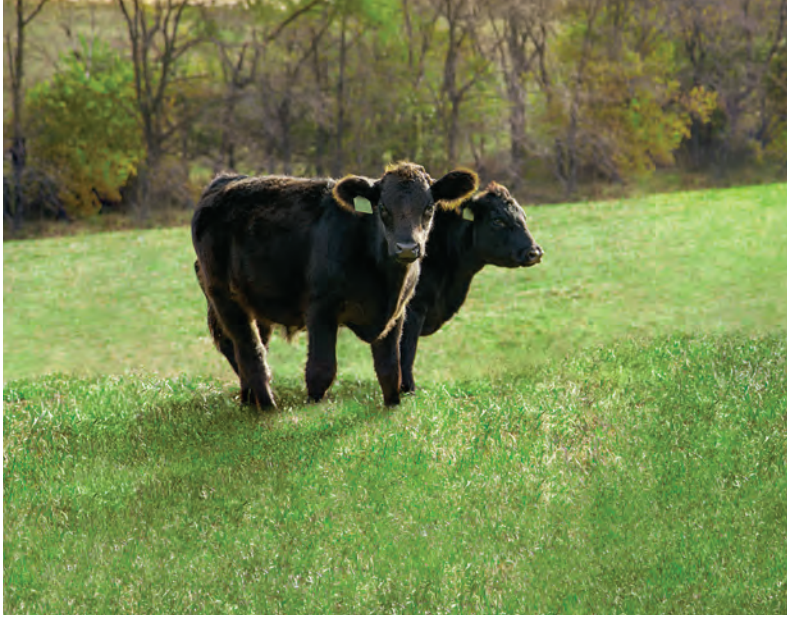
The improved forage quality of pastures with white clover also benefits cow-calf enterprises. White clover delivers a higher level of nutrition to improve body condition, reproduction, milking and weaning weight. As producers know, any increase in conception rates has a big impact on profitability.

Researchers in Illinois and Indiana compared conception rates of cows grazing endophyte-infected tall fescue with and without legumes. A significant clover presence in the forage mix increased conception rates 19% to 28% (14 to 20 percentage points). See **Table 3**.

Table 3. Clover Improves Conception Rate

Pasture	Conception Rate (%)	State
Tall Fescue	75%	Illinois
Tall Fescue + Clover	89%	
Tall Fescue + Clover	89%	Indiana
Tall Fescue + Clover	89%	

Adapted from Renovatin Hay and Pasture Fields, AGR-26, G.D. Lacefield and S. Ray Smith, University of Kentucky



Clovers in the diet also reduce the likelihood of grass tetany in cattle. Grass tetany is a symptom of magnesium deficiency. Clovers contain higher levels of magnesium than do grasses.

The bottom line of all these benefits is improved profitability through lower costs, greater gains and more calves.

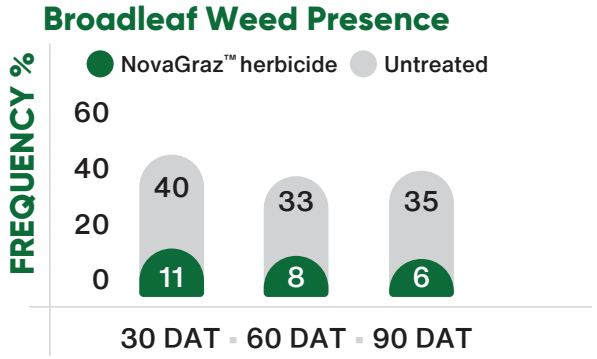
Clover benefits fade when weeds flourish. Keep those clover benefits with a better weed control option.

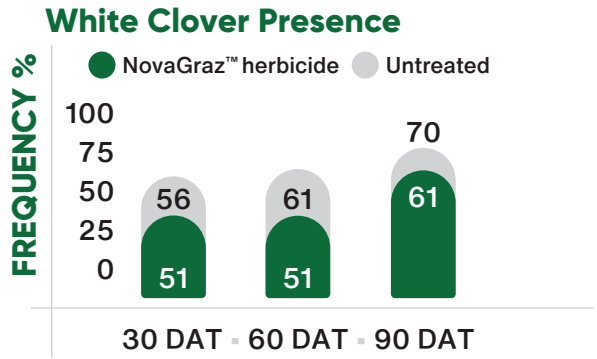
Broadleaf weeds in pasture typically reduce forage production by 1 to 1.5 pounds for each pound of weed grown over the season. Weeds with sharp thorns, awns, or spines may also interfere with cattle grazing.

By eliminating weedy competition in cool-season grass/white clover pastures, the amount of forage produced increases and improves utilization. One pasture acre feeds more cattle or the same number of cattle longer.

In research trials, NovaGraz™ herbicide substantially reduced weed pressure. And it did so with minimal impact on white clover populations. **See the bar chart**.

Vegetation Presence*
After 24 fl oz Per Acre NovaGraz™ Herbicide





DAT = Days of Treatment

**Presence is defined as how commonly the vegetation class is observed at random points across the pasture.*

Combined data from Lancaster, WI and Prairie Du Sac, WI (2019)

With less weed competition, forage production increases. In Missouri trials, grass/white clover pastures treated with NovaGraz produced 21% more forage compared to untreated sites. **See Table 4**.

Forage Production and Utilization

	NovaGraz™ herbicide	Untreated
Total Forage Production (LB/DM/A)	**8,344**	6,882
Forage Utilization (%)	**61%**	37%
End of Season Broadleaves (LB/DM/A)	**85**	890
30-Day Adjusted Forage Regrowth (LB/DM/A)	**827**	265
Forage Remaining at End-of-Season (LB/DM/A)	**2,158**	1,156

LB/DM/A = Pounds of Dry Matter per Acre

Biomass measurements comparing untreated pastures treated with NovaGraz™ herbicide at Sarcoxie, Missouri site. Data was collected from July 1, 2019 through Oct. 8, 2019. Pastures were grazed to a residual height of approximately 4 to 6 inches followed by a 30-day rest period.

NovaGraz herbicide offers broader-spectrum weed control than 2,4-D alone and keeps desirable forage that mowing would remove.

If broadleaf weeds are limiting forage production from your grass/white clover pastures, NovaGraz is the solution.

Apply correctly and know what to expect.

- NovaGraz™ herbicide is most effective when 90% of target weeds have emerged and are actively growing. For biennials such as musk thistle, that's usually early to mid-spring or late in the fall. For weed species such as spiny pigweed, ironweed and cocklebur, it may be late spring to early summer.
- The primary use rate for NovaGraz herbicide is 24 fluid ounces per acre. The maximum use rate is 48 fluid ounces per acre per year. That allows for an enhanced control spectrum or a repeat application.
- The adjuvant requirement with NovaGraz herbicide is a straight methylated seed oil (MSO) adjuvant at a rate of 1% volume/volume.
- Follow all label instructions for application and handling.

Know what to look for after application. Initially, you may be startled.

NovaGraz™ herbicide offers broad-spectrum weed control in pastures while preserving white clover and annual lespedeza. But soon after application, white clover will yellow slightly and lodge for a short period. In this instance, lodging may occur with white clover laying over a little but will stand back up after a few weeks. Symptoms vary, but the effect may test your nerve.

After application, expect white clover to turn slightly yellow and lodge within one to two days. Plants usually will remain lodged and yellow for two to three weeks.

About three weeks after application, white clover will begin to regain vigor and grow out of the lodging phase. At four to six weeks, white clover will regain fully its vigor and it may bloom.

Annual lespedeza, on other hand, shows very little effect from the herbicide. It may show a slight yellowing of leaves and no lodging.

Several things can affect the recovery of white clover after spraying. White clover varieties that are bred for yield and vigor are generally more tolerant than common, low-growing white clover varieties that have become naturalized in pastures.

Any weather that slows growth of normal plants can also slow the recovery of white clover and annual lespedeza treated with NovaGraz. That includes too hot, too cold, too wet, too dry. Grazing management also affects recovery.

Graze before and after spraying.

NovaGraz™ herbicide is not residually active in the soil. It relies on leaf contact to control susceptible weeds. Grazing a pasture before spraying may better expose weeds to the herbicide.

Grazing before application also reduces leaf cover of white clover and annual lespedeza. That will reduce contact of those plants with the herbicide.


One Week After Application


Two Weeks After Application


Three Weeks After Application


Four Weeks After Application


Five Weeks After Application

Following an application of NovaGraz™ herbicide, white clover will typically yellow and lodge for about three weeks. By week three, however, recovery begins. After four to six weeks, the only evidence of NovaGraz is a lack of weeds.

Also plan to graze treated pastures two to four weeks after application with NovaGraz™ herbicide. Grasses will have a competitive advantage over the legumes after spraying. Without grazing pressure, grass growth may boom. That competition can prolong the recovery period for legumes or even crowd out stressed white clover and annual lespedeza.

Delay a hay cutting until at least 14 days after an application of NovaGraz.

That allows enough time for the weeds to absorb the herbicide, so you get the full control benefit. Harvesting before 14 days removes competetive grasses just as white clover and annual lespedeza are beginning to regain vigor.

Omit nitrogen from fertilizer.

If you fertilize a pasture treated with NovaGraz™ herbicide, don't include nitrogen (N). Nitrogen will give grasses a boost in growth and allow them to out compete white clover and annual lespedeza. The N in fertilizer also inhibits N fixation by the legumes.

Contact your local range and pasture herbicide retailer or your area Corteva Range & Pasture Specialist. You can find your Corteva R&P Specialist on the Corteva Range & Pasture website at RangeAndPasture.com. The direct link to the specialist directory is here at **RangeAndPasture.com/Specialists**.

RangeAndPasture.com also hosts the product label for NovaGraz herbicide and a world of information on pasture management.

You can raise the highest quality and quantity of forage for your cattle. NovaGraz™ herbicide is the tool to help.

NovaGraz™
HERBICIDE

Range & Pasture™

@CortevaPastures
@CortevaPastures
@CortevaPastures

CORTEVA™ agriscience

Visit us at **NovaGraz.us**