Integrating Weed Management Practices to Enhance Productivity of Grazed Pastures

J. D. Green, Extension Weed Scientist
Josh Tolson, Graduate Research Assistant
University of Kentucky

As animal grazing has intensified within Kentucky and the surrounding region problematic weeds such as tall ironweed, spiny amaranth, horsenettle, buttercup, common cocklebur, and thistles have been increasing. These weeds become prominent in pastures because they have spines, thorns, or are unpalatable to animals. Animals selectively graze and avoid these weedy plants and with intensive grazing practices their populations are allowed to increase. Livestock producers are seeking ways to increase pasture productivity by minimizing the impact of these and other weeds on grazed lands.

One of the primary means used to fight weeds in pastures has been mowing, a mechanical control method. Pastures are typically mowed only once and occasionally twice per year. Not all fields are mowed in a timely manner to reduce new weed seed production or to limit top growth of unwanted vegetation. Rising gasoline and diesel fuel prices have greatly increased mowing cost. Maintaining optimum soil pH and added fertility is also known to increase pasture productivity. This cultural practice is not always used as extensively as it could be to reduce the impact of weedy plants and increase pasture productivity. Furthermore, livestock and hay producers have also been challenged with rapidly rising fertilizer prices.

Herbicides are another control method available to curtail broadleaf weed problems in pastures. If herbicides are applied at the right time biennial thistles, buttercup, and cocklebur can be easily controlled. In recent years newer herbicide products have been introduced that are more effective on problematic weeds such as tall ironweed, Canada thistle, and horsenettle. In general, herbicides are not widely used. Some of the primary reasons given for limited use are that broadleaf herbicides have the potential to kill clovers, herbicides are too expensive, and the need of spray equipment suitable for use on pastures. Regardless of effectiveness, chemical weed control is seen as an additional expense that producers struggle to justify. A more ideal approach to weed management in grazed pastures could be the use of integrated control tactics that achieve long-term control of problematic weeds and ultimately increase forage productivity. Previous research on tall ironweed indicates that one mid-summer mowing followed by fall herbicide application was highly effective in reducing tall ironweed populations during the next growing season.

Research Objectives
Field research studies were initiated in 2008 to evaluate mechanical (mowing),
chemical (herbicide treatment), and a
cultural practice (added fertility) affects
on weed populations and forage yield.
A total of eight different treatments
compared untreated areas with each
main factor alone of mowing, herbicide
application, and added fertility; and a
combination of each of these factors
including all three factors combined.
Research trials were established on
three beef cattle farms located near
Lawrenceburg [Anderson county],
Tompkinsville [Monroe county], and
Richmond [Madison county], Kentucky
and continued through the 2010 season.
Mowed treatments were performed in
July each year, herbicide treatment was
applied once in August 2008 [except the
Monroe location received an additional
herbicide application in 2009], and
fertilization added in September.
Nitrogen was added in the fall as
ammonium nitrate (50 lb N) at all
locations. Phosphorus and potash were
added based on soil test
recommendations. The cost of inputs
associated with each treatment and the
forage value achieved by these various
weed management strategies were
used to determine if economic returns
justify higher levels of weed
management.

The intended outcome of this project
was to help determine whether or not
mechanical, chemical or cultural control
methods or an integrated approach of
these management practices provide
the most benefit to livestock producers
in reducing the impact of weeds on
forage production. If a positive net
return can be realized with specific
weed management practices, producers
may be encouraged to implement
strategies which decrease weed
populations, and subsequently increase
forage productivity.

Weed Populations
Weed species and weed populations
varied by location with tall ironweed
present at all three sites. Although there
were other weed species present, the
predominate weeds evaluated in
Anderson county were tall ironweed
goldenrod, marshelder, and tick clover
(Desmodium spp.); at Monroe county
tall ironweed, common ragweed,
marestail, and tick clover; and at
Madison county tall ironweed,
horsenettle, clammy groundcherry, and
common cocklebur. Mowing and/or
added fertility did little to reduce the
population of most weeds present
relative to the untreated areas.
Whereas, treatments that included an
herbicide application did significantly
decrease weed density. In herbicide
-treated areas a decline in weed
population was observed during the first
year and continued to be effective into
the second year after application.

Weed Biomass and Forage Yields
Weed biomass and forage yields were
determined at all locations during the
spring in 2009 and 2010. During the fall
of 2009 an additional harvest was taken
at the Anderson and Madison county
sites. For determining relative biomass
yields (dry weight produced with each
treatment) three sub-samples were
harvested from individual plots and
separated into weeds, forage grasses,
and clover (present at 2 of 3 sites).

At Anderson County approximately 4300
lb of dry matter (total biomass) was
produced from the untreated areas
(Figure 1). However, 45% of this yield
was the result of weeds and 55% of this
biomass was due to desirable grasses. Fertility alone provided a higher total biomass yield by increasing forage grasses, but the weed biomass remained the same as the untreated. The mowing treatment and herbicide alone provided a similar total yield as the untreated areas, but provided a higher percentage of forage grasses with lower weed biomass. Combinations of added fertility with mowing or with herbicide provided the highest total yields. Combinations of herbicide + fertility, mowing + herbicide, and mowing + herbicide + fertility resulted in the lowest level of weed biomass indicating fewer weeds.

Monroe County had similar trends in total biomass yield as observed with treatments in Anderson County (Figure 2). Approximately 30% of biomass produced was due to weeds in the untreated areas. Added fertility increased grass yield, but clover yield and weed biomass remained the same as the untreated areas. Mowing alone increased clover yield and resulted in a decrease in weed biomass. However, mowing + fertility resulted in a similar level of weeds produced as the untreated. All treatments that included a herbicide provided higher forage grass yields compared to the untreated areas and had the lowest level of weed biomass. While clover was killed in all herbicide treated areas since this location received an herbicide application both in 2008 and 2009.

Figure 1. Forage yield and total biomass at Anderson County 2009-2010 (3 harvests)
Relative biomass yields between treatments at Madison County were somewhat different than yields observed at the other two sites. Furthermore, a lower percentage of weeds were present at this site relative to desirable grasses and clover as illustrated by the untreated areas. At this site hay is cut in the spring followed by grazing in late summer. Except for the fertility treatment the untreated area had a total biomass that exceeded the yields of the other treatments. The response to added fertility was an increase in forage grass yields with no effect on weed biomass as observed at the other two locations. Mowing resulted in lower grass yields, but the percentage of clover present increased. Mowing alone had little affect on decreasing weed biomass. Herbicide treatments significantly decreased weed biomass. Clover was not present the first year after herbicide treatment in 2008 (results for 2009 not shown), however, volunteer clover did germinate in the early spring of 2010 and provided measurable yields.
Economic Assessment

Best economic returns were obtained with the herbicide treatment alone at all three locations as determined by the value of the desirable forages produced (grasses and clover) relative to the cost of herbicide treatment, particularly since input cost can be prorated over a two year period. Net returns to the cost of mowing were equivalent to the forage value obtained from the untreated areas at Anderson and Monroe counties, but not in Madison. Treatment combinations of mowing + herbicide, which had fewer weeds, provided a partial economic benefit at Anderson and Madison counties. Increasing forage yields with added fertility did not result in a net return in forage profitability due to the high cost associated with added nitrogen and other nutrients.

Acknowledgements

Funding for this project was provided through the USDA-Southern Region IPM Grants Program. Project leaders include J. D. Green (weed scientist), Bill Witt (weed scientist), Greg Schwab (soil scientist), and Kenny Burdine (Agriculture Economist). The authors also acknowledge the assistance and cooperation of county extension agents for agriculture and natural resources Tommy Yankey, Brandon Sears, and Kevin Lyons, and livestock producers Walter Majors, Billy Glen Turpin, and Jimmie Thompson who provided land resources for this project.