UK COOPERATIVE EXTENSION SERVICE
University of Kentucky – College of Agriculture

LEXINGTON, KY 40546

Corn & Soybean News

March, 2007, Volume 7, Issue 3

Available online at: www.uky.edu/Ag/CornSoy

Cooperating Departments: Agricultural Economics, Biosystems and Agricultural Engineering, Entomology, Plant and Soil Sciences, Plant Pathology
Editor: Chad Lee

In this Issue:

1. ALS-Tolerant Johnsongrass in Kentucky

J. D. Green, W. W. Witt, Plant and Soil Science
David Herbst, Adair County Extension

Johnsongrass (*Sorghum halepense* L.) remains a common weed, ranking as the third most frequently observed weed species within Kentucky. The introduction of nicosulfuron (i.e. Accent) and primisulfuron (i.e. Beacon) in 1990 provided corn producers with two postemergence herbicide tools to selectively control johnsongrass after corn emergence. These and other ALS (acetolactate synthase inhibitor) herbicides effectively managed johnsongrass in corn fields. In recent years, however, poor control with some ALS-inhibiting herbicides was reported. Greenhouse and field studies were conducted to determine if johnsongrass tolerance to ALS-type herbicides had developed in Kentucky.


Johnsongrass is extremely competitive. Image source: J. D. Green

- Two johnsongrass populations are tolerating normal rates of ALS-inhibiting herbicides.
- ALS-inhibiting herbicides include Accent, Beacon, Option and Lightning.
- Relying on the same mode of action increases the risk of resistance.

Fields in Question
Poor johnsongrass control was observed in two corn fields; one located in Marion county and another in Adair county. Both fields were in continuous corn production for at least five years. The field in Adair county was frequently used for corn silage production. Herbicides containing nicosulfuron were applied each year for johnsongrass control.

Greenhouse study: Johnsongrass seeds collected from problem fields in Marion

county (2004) and Adair county (2005) along with seed from a population known to be susceptible to Accent were planted in the greenhouse. Seedling johnsongrass (8 to 12 inches tall) from Adair County and Marion County was not controlled when Accent was applied at 1x, 5x, or 10x of the normal application rate of 0.67 oz/A (Figure 1). Fresh weight or dry weight (data not shown) of treated johnsongrass plants were not reduced even at the 10x rate with plants grown from seed collected from these two sites. Whereas, plant biomass was reduced by 70% or more with plants from a susceptible population of johnsongrass, even when treated with the lowest rate of Accent (0.67 oz/A).

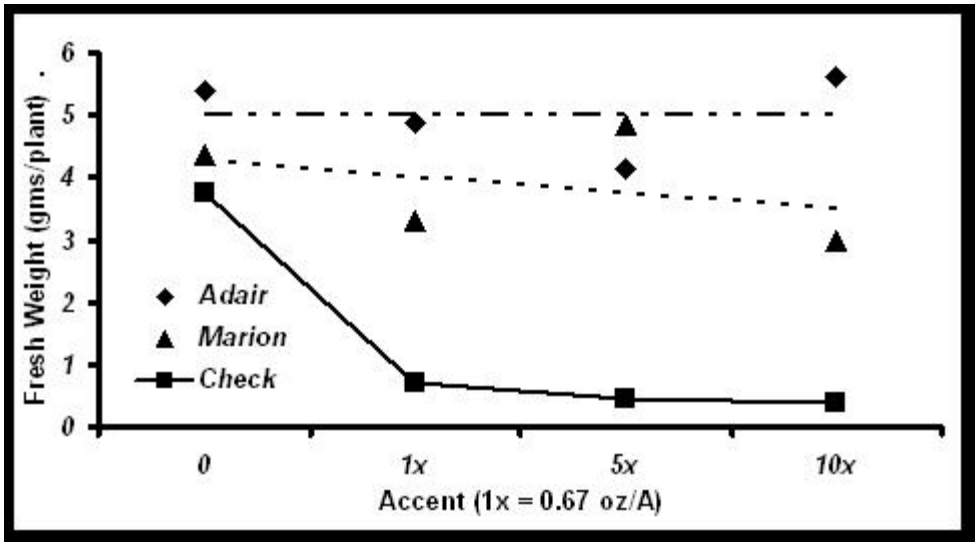


Figure 1. Johnsongrass response to Accent (nicosulfuron) herbicide in greenhouse studies. Less fresh weight means better control with Accent.

Field study: Johnsongrass control at the Adair field site was poor with all ALS-type herbicides (Figure 2). Little or no control of johnsongrass was observed with Accent (nicosulfuron) and Option (foramsulfuron) at both the 1x and 2x application rates and Beacon (primisulfuron) at the 1x rate. Beacon at the 2x rate and other ALS-herbicides such as Steadfast (nicosulfuron + rimsulfuron) and Lightning (imazethapyr + imazapyr) provided 35 to 45% visual control.

The three non ALS-herbicides (Select, Assure II and Roundup) provided good control (80% or more visual control of treated johnsongrass). The exception was 68% control with Assure II when applied at the 1x rate. Best results (90% control) were achieved with the glyphosate (i.e. Roundup) treatment.

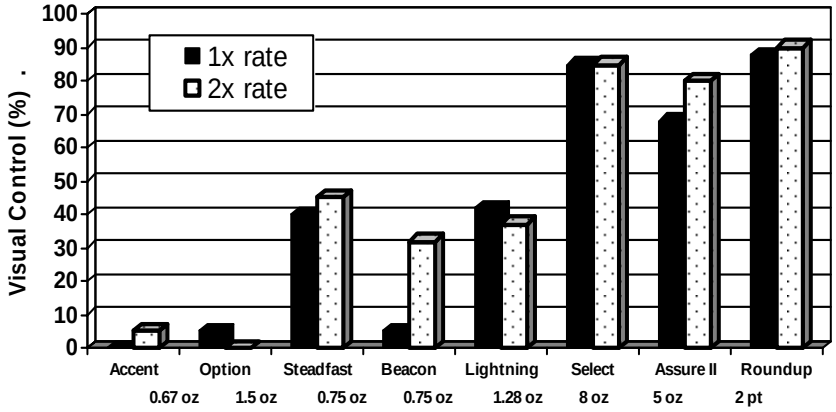


Figure 2. Field study in Adair County to evaluate Johnsongrass response to herbicides sprayed in the field. The 1x rates are listed beneath each herbicide. 100% = all dead plants; 0% = no dead plants.

Johnsongrass Summary

Our results indicate that at least two johnsongrass populations in Kentucky were not effectively controlled by nicosulfuron, or other ALS-inhibitor herbicides. Other herbicide products used for johnsongrass control or suppression which have ALS modes of activity include Beacon, Equip, Exceed, Spirit, Steadfast, Option, and Lightning. Therefore, caution should be used to avoid year to year dependence on these herbicide products for johnsongrass control in corn.

Since the effect on succeeding generations have not yet been conducted to confirm resistance, these findings are not fully conclusive that johnsongrass populations are resistant to nicosulfuron (Accent) or other ALS-herbicides. However, we do know that these two populations were not controlled by nicosulfuron in greenhouse evaluations nor in the field in 2006. Clearly, these are strong indications of resistance.

Management of this problem in corn will require planting corn hybrids which have tolerance to glyphosate (eg. Roundup, Glyphomax, Touchdown, etc.). Management of this problem in soybeans can include Assure II, Fusion, Select, or glyphosate (i.e. Roundup Ready soybeans). Weed management programs with non-ALS herbicides will be required for two to three years to reduce johnsongrass populations in these fields. Crop producers should always alternate herbicide chemistry to help prevent or minimize future herbicide resistant problems.

At this time we do not know the full extent at which poor johnsongrass control is occurring throughout Kentucky following the use of ALS-type herbicides. We are interested in knowing about other fields in which johnsongrass was not effectively controlled by Accent, Beacon, Equip, Exceed, Spirit, Steadfast, Option, Lightning, or other ALS-inhibiting herbicides. The development of widespread resistance to these herbicides by johnsongrass (or other weeds) would have an enormous impact on corn production. Please notify us through your local county Extension office if you are aware of any fields in which lack of johnsongrass control could be attributed to continuous use of the above mentioned herbicides.

More information about the findings from this study are printed in WS 07-2 and are available at the Grain Crops Extension website: http://www.uky.edu/Ag/GrainCrops/.

2. Planting More Corn? Use Soil Testing to Choose Your Fields Wisely

Greg Schwab, Plant and Soil Sciences

- If switching from forages to corn, then check soil fertility levels.
- Fertilizer requirements could cost $50/acre.

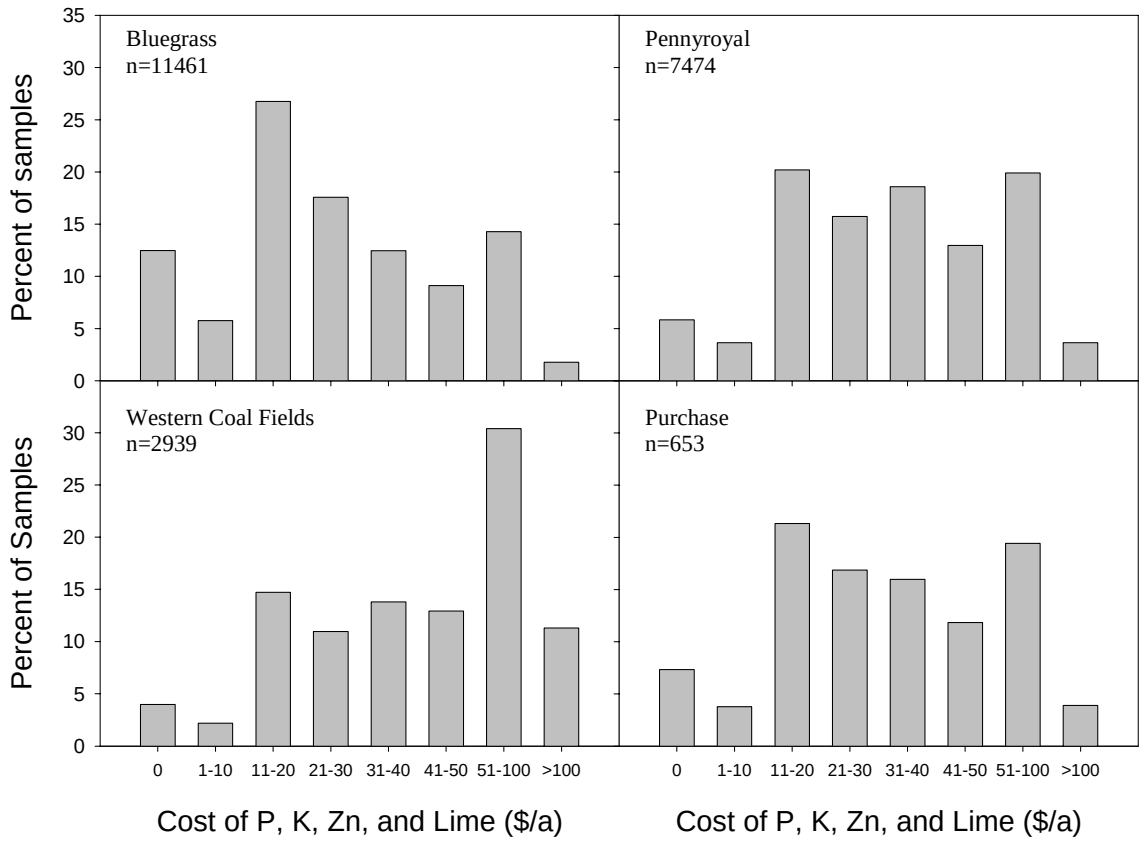
Many Kentucky farmers are planning to plant more corn this year, due to higher prices. Looking at their economic situation, it is easy to see that some of this new acreage will likely come from fields currently in forage production. How much additional fertilizer will these fields require to grow corn? The answer depends on how well the forages were managed. Keep in mind, nitrogen requirements for corn following legume forages is 25-50 lbs N/acre less than when corn follows other grain crops, so part of the additional fertilizer expense will be offset by lower N requirements.

Soil samples where forages were the intended crop provide some insight into the expected fertilizer costs for switching to corn. Approximately 22,500 soil samples where forages were the intended crop were submitted to the UK Soil Testing Labs over the past three years. Recommendations from those soil test results were recalculated assuming corn would be the new intended crop. Fertilizer prices of $0.22/lb P_2O_5, $0.22/lb K_2O, $1.20/lb Zn, and $12/ton lime were used to calculate fertilizer cost (nitrogen cost is not factored into this analysis).

Results show that the cost ranged from $0 to $146/acre, with an average of $22 to $45/acre depending on the region. The Bluegrass had the lowest average cost while

the Western Coalfields had the highest average cost. In all of the regions, there were a high percentage of samples requiring more than $50/acre of fertilizer.

By soil testing early this spring, corn producers can identify fields that have a relatively low need for additional fertilization, thus minimizing input costs. In fact, if fields are chosen correctly, corn following forages could be significantly cheaper than corn following grain crops because of the lower N requirements. Alternatively, if corn is going to be grown on some of these very poor testing soils, then farmers must realize that a significant investment in fertilizer is needed to avoid yield limiting soil pH or nutrient deficiencies.



3. Better Soil as Important as Fertilizer N When Growing Corn After Grass/Legume Forages

John H. Grove, Plant and Soil Sciences

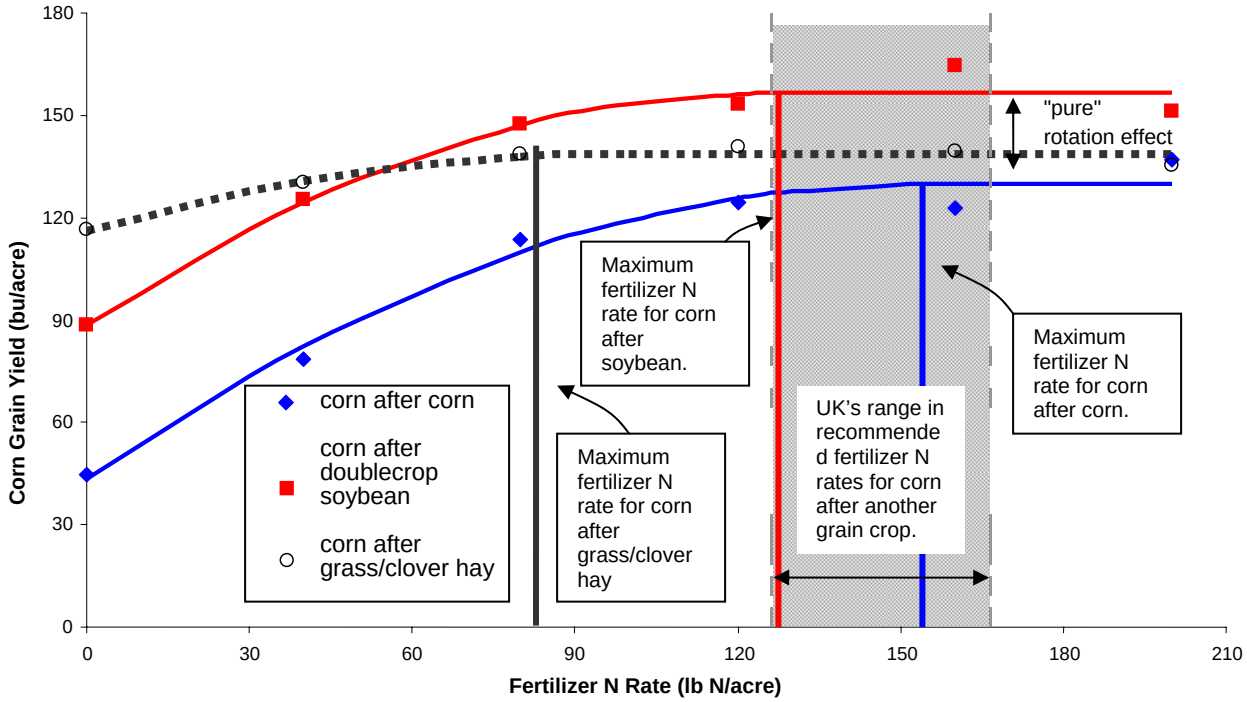
High corn prices are causing cattle producers to consider growing more of their feed grain needs in their pasture and hay fields. In Kentucky's environment, plant available water (soil moisture) and nitrogen are the two most corn yield-limiting factors and both need to be considered to maximize corn's profit potential. Pasture and hay production are often located in fields not thought to contain "good corn soils", but even these will vary in their corn yield potential.

UK's fertilizer N rate recommendations consider soil drainage, tillage, fertilizer N timing, nitrification inhibitor use, and previous crop. If forage is a previous crop, then recommended N rates can be reduced by 25 to 50 lb N/acre. Figure 1 illustrates some of our data averaged from 2004 and 2005 production years. No-till corn was grown after corn, wheat/doublecrop soybean, and grass/clover hay on a Maury silt loam. Ammonium nitrate was applied at different rates just after planting.

- Corn after forages: reduce N rates by 25 to 50 lbs/acre
- Poor soils with low yield potential: N rates above 40 lb/acre, less likely to make a profit.

Yield response to fertilizer N was determined for corn in each crop rotation. Maximum fertilizer N rates were determined at the point where no further yield response to fertilizer N occurred. On a Maury silt loam in 2004 and 2005, fertilizer N rates for corn after a grain crop were within range of the UK fertilizer N rates recommended. Maximum fertilizer N rates for corn after grass/clover hay fell well below that range. The "yield penalty" to corn after corn (the rotation effect) was 10 bu/acre when compared to first-year corn after grass/clover hay. This penalty was independent of the yield response to fertilizer N rate.

Figure 1. Corn Yield Response to Fertilizer N and Rotation on a Well-Drained Soil (average of 2004 and 2005 growing seasons.)



The data in Figure 1, for only two years, was combined with earlier data, from the mid-1990's, to give 5 years of N response information for corn after corn or corn after grass/clover hay (Table 1). The corn after grass/clover hay data were separated by soil. The better soil area, which provides more plant available water to the crop, was a mixture of deep Maury and Huntington series, while the poorer soil area was a mixture of McAfee and shallow Maury soils.

Table 1 gives the average corn yield response to fertilizer N, the average increment in corn yield with each additional 40 lb N/acre, and the increment ratio (bu/lb N). If fertilizer N is worth $0.45/lb, and corn is $3.75/bu, then the increment ratio must be greater than 0.12 bu/lb N for that increment of 40 lb N/acre to be profitable. When corn was grown after corn, fertilizer N was usually profitable (4 out of 5 years) up to 120 lb N/acre. The profitability of 160 or 200 lb N/acre was a coin toss (50%). Corn after grass/clover hay was usually responsive (3 out of 5 years) to 40 lb N/acre, regardless of soil quality. The better quality soil, with greater plant available water holding capacity, exhibited greater yield potential (+19 bu/acre), and responded profitably more often (3 out of 5 years) to 80 lb N/acre. Fertilizer N rates above 80 lb N/acre were unprofitable more often than not.

Clearly, corn following grass/legume forage needed less fertilizer N to reach maximum yield potential. But maximum yield potential depended strongly on the soil selected for no-till corn production.

Table 1. Corn Yield Response to Rotation, Soil Quality, and Fertilizer N Rate.

corn rotation – soil quality	fertilizer N rate	average grain yield	average grain yield increment	average yield increment per lb N
	lb N/acre	bu/acre	bu/acre	bu/lb N
corn after corn	0	60		
	40	86	26	0.65
	80	118	32	0.80
	120	135	17	0.43
	160	141	6	0.15
	200	153	12	0.30
corn after grass/clover hay - poorer soil	0	122		
	40	140	18	0.45
	80	140	0	0.00
	120	142	2	0.05
	160	141	-1	-0.03
	200	145	4	0.10
corn after grass/clover hay - better soil	0	128		
	40	144	16	0.40
	80	163	19	0.48
	120	156	-7	-0.18
	160	165	9	0.23
	200	157	-8	-0.20

4. Seed Concerns: You Can't Always Get What you Want

Tom Miller, Ballard County Extension
Chad Lee, Plant and Soil Sciences

Seed companies and farmers face a time when there are a whole lot of options for hybrids and, at the same time, very few options. Farmers may not be able to get the hybrid(s) they want for 2007. This challenge may be with us for several years.

Unlike a chemical that can be manufactured quickly, hybrid corn seed has to be grown the season before. So the seed companies are always guessing a year or two ahead to produce the hybrids they think you want. The method has become extremely difficult as companies try to identify the right combination of biotech traits with a set of base genetics that has yield potential and possibly other defensive traits.

As a producer, you may be interested in Hybrid "A". You may want the conventional, no-traits-added version of Hybrid "A". Or you can get that hybrid in Roundup Ready, Liberty Link, Bt corn borer (which also may be Liberty Link) and Bt corn rootworm (which also may be Liberty Link), or just about any combination of these traits. This is just one example of where you could get as many as ten different options on that base genetics.

Once you have decided which option you want, then you have to decide if you want insecticide seed treatment and at what dose. In addition, you may want rounds or flats, depending on your planter configuration. Now, you have a base genetics that may have up to 20 variations when upon delivery this spring.

The seed companies may have 10 different base genetics that fit your growing area. With another 10 trait options for each set of base genetics, the seed company has to forecast farmer demand in about 100 different hybrids for your growing area. As new

- The biotech traits create many more options.
- The options are not always packaged the way you would prefer.
- For 2007, it's too late; Plan early for 2008.

traits are added to the toolbox, the options get even larger.

Any seed company can probably do a great job of forecasting demand for 10 hybrids within a particular growing region. A company has a much more difficult time forecasting 100 options. As a result, seed companies may decide to 'stack' traits, thus reducing the number of options they offer and simplifying the task of forecasting market demand. Some companies provide some hybrids with a seed treatment, whether you want it or not.

You may only want to purchase a Roundup Ready hybrid. But the genetics you want is in a Roundup Ready-Bt corn borer stack. You end up paying for technology you don't want.

Add to all of this the prediction that corn production in the US will increase by 8 to10 million acres in 2007. Now, you can begin to see some real challenges in buying the seed you want. Don't even ask for it in rounds or flats. Many farmers have had difficulty in getting the hybrid(s) they want with the options they want for 2007. This difficulty is likely to be with us several more years.

A company could capture tremendous market share if its scientists figure out how to put all the traits into one hybrid and then turn off the trait(s) you don't want to pay for. We are at least several years away from this scenario.

For 2007, you will have to buy what is available, not what you want. For 2008, the best bet is to use university and county trials to identify several hybrids with proven performance records. Try to book that seed in November (although the companies would prefer an even earlier booking). Now you have a contingency plan in place if your first choice is not available.

5. Winter 2006/2007 in Kentucky: Two Faced!

Tom Priddy, Biosystems and Agricultural Engineering

- Warm and cold define the past three months.
- Rainfall should be near normal this spring.

Kentucky has seen two faces of El Nino this winter. Weak to moderate El Nino conditions in the equatorial Pacific provided two very different climate patterns for the Bluegrass state so far this winter. The first half of this winter was dominated by very mild temperatures and below normal precipitation for the state...which is the typical climate pattern for Kentucky from El Nino. This lasted until the third week of January. Kentucky experienced 6 to 9 days with high temperatures in the 60's this past December...and 8 to 10 days in January with highs in the 60's.

Part of winter has been very cold.
Image source: Chad Lee

Then on the 16th of January, the Arctic Express blasted into the Ohio Valley and Kentucky...and provided very cold air and frequent light snow events into the middle of February. In fact, in a preliminary analysis for the first 11 days of February, indicated that, so far, this February has been the 2nd coldest February for the past 112 years (period of record) for the Bluegrass state. The coldest was 1978 (21.2 degrees) and the 3rd coldest was...1895 (22.9 degrees). This year temperatures averaged 22.3 degrees, which was about 11 degrees below normal.

What's next for Kentucky?

El Nino is expected to fade away to near normal conditions over the equatorial Pacific over the next couple of months. This will allow the jet stream to return to a more normal position...and minimize the split flow to one flow pattern in the jet stream.

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Cooperative Extension Service
University of Kentucky
Plant and Soil Sciences Department
Ag. Distribution Center
229 Stadium View Road
Lexington KY 40546-0229

What this means for Kentucky is a return to more normal weather patterns as we move into spring.

Here's the official National Weather Service outlook:
The latest medium-range outlooks indicate a return to above normal temperatures and precipitation for the Commonwealth for the period Thursday, February 22th through Friday, March 2nd. The updated 30-day outlook for Kentucky for March 2007 and the 90-day outlook for March thru May, 2007, calls for near normal temperatures and precipitation.

For more information on Kentucky Weather go to the Kentucky Ag Weather Center:
http://wwwagwx.ca.uky.edu/

Chad D. Lee, Grain Crops Extension Specialist
423 Plant Sciences Building
1405 Veterans Drive
Lexington, KY 40546-0312