Corn & Soybean News

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COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT
Grain and Forage Center of Excellence

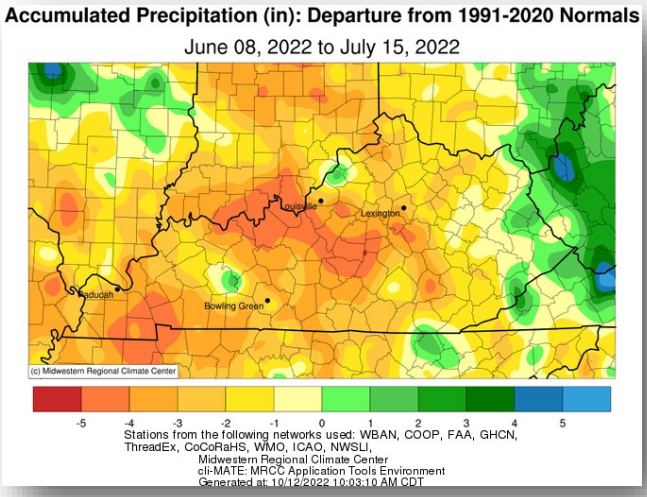
University of Kentucky

Timing is Everything on Corn Yields this Year

A county agent sat in the buddy seat on a combine and watched the yield monitor swing from 300 bushels per acre to zero and back again. One hundred-forty miles away a farmer videoed his yield monitor starting at 260 bushels per acre in the low areas and drop to zero as the combine climbed to higher elevations. These are just two examples of what we are seeing across Kentucky this year. It is a reminder of just how important water to corn yield was this season, but also, how important the timing of that water was this year.

From June 8 to July 15, most of Kentucky was short on rainfall by as much as 3 inches in some areas (Figure 1). Shifting the calendar to June 20 to August 20 shows that Kentucky was closer to normal in rainfall, except on far western Kentucky. The monthly precipitation for western Kentucky further defines just how dry May and June was for that part of the state (Figure 2). Our corn crop agrees with these weather maps. Much of our corn was pollinating in the early part of July, especially corn in western Kentucky. For corn that pollinated later, because of later planting dates, that corn pollinated in less stressful conditions and has better yields.

Figure 1. Kentucky rainfall departure from normal for June 8 to July 15, 2022 (left) and from June 20 to August 20, 2022 (right). Graphics courtesy of the Kentucky USDA-NASS Office.



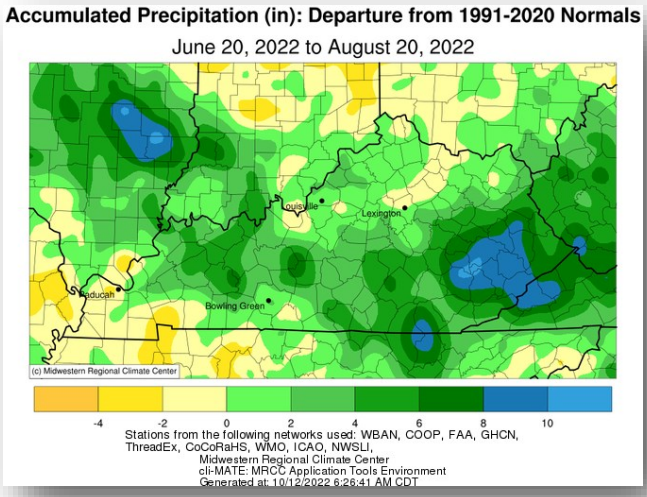
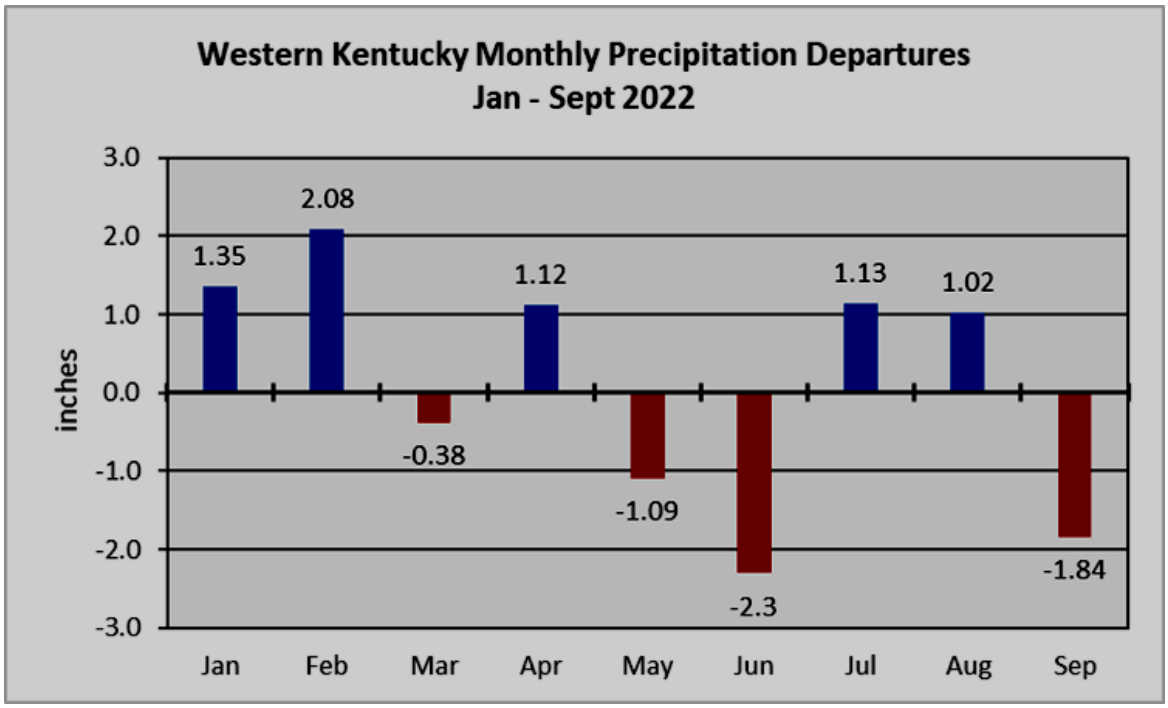


Figure 3. Western Kentucky Monthly Precipitation Departures from Normal. Data obtained by Matt Dixon with UKAg Weather Data Center from the MRCC database: https://mrcc.purdue.edu/CLIMATE/



The Kentucky USDA-NASS is projecting corn yields to be 149 bushels per acre, down 22% from the record yield in 2021. In my much, much less scientific conversations with farmers around Kentucky, the number is probably close to that. Given the amount of corn pollinating during the water deficits in June and July, this is an amazing number.

About 66% of the Kentucky corn crop underwent water stress during the worst possible time. The only management option that would have helped at this time was irrigation. If a farmer could not irrigate, then no management was going to fix this problem. Once pollination was damaged, corn cannot make up the yield difference. Some plants might have produced larger kernels, but that larger seed size was not enough to make up the yield.

To repeat, no crop management method, except for irrigation, was going to overcome the extent of dry weather the corn crop faced this summer. As farmers look at this year's yields and ponder next year's decisions, there are some key points to consider:

1. The timing of rainfall relative to corn growth and development was more important than any other management factor this year.
2. This is a bad year to compare one field to the next. The water and crop growth timing was slightly different from field to field and from low spot to high spot in the same field.
3. This is a bad year to assess a new hybrids. See bullet point 1. Differences in hybrid yields this year has more to do with timing than genetics.

4. This is a bad year to compare late-maturing hybrids to early-maturing hybrids. In some parts of the state, 118-day corn will do better than 110-day corn. In other parts of the state, the reverse is true. See bullet point 1.
5. This is a bad year to look at planting date. Early planting was better in some areas and late planting was better in others.
6. This was a great year to test products promoted to alleviate stress… if you had a check strip or two in the same field. You cannot compare one field to the next. See bullet point 2.
7. This is a good year to reconsider marketing strategy and determine just what percent of the expected crop can be marketed ahead for the 2023 harvest.

This year was a difficult one in which to grow a corn crop. If the USDA NASS estimate of 149 bushels per acre is correct, then the yields are a testimony to excellent hybrids and crop management. However, the timing to the dry weather was such that everyone should be very cautious about using the results from this year to apply to decisions in the future.

Thanks to David Knopf and Matthew Dixon for allowing me to use their weather data and graphics. Thanks to Conner Raymond for reviewing this article.

Resources:

MRCC Database: https://mrcc.purdue.edu/CLIMATE/

USDA NASS Kentucky website: https://www.nass.usda.gov/Statistics_by_State/Kentucky/index.php

USDA NASS Kentucky Crop Progress and Conditions page: https://www.nass.usda.gov/Statistics_by_State/Kentucky/Publications/Crop_Progress_&_Condition/index.php

USDA NASS National Crop Progress page: https://www.nass.usda.gov/Publications/State_Crop_Progress_and_Condition/index.php

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Soil Acidity: What It Is, How It Is Measured, Why It Is Important

The chemical health of the soil supporting your crop is strongly related to soil pH and fall is the best time to correct excess soil acidity. Soils are usually dry and application traffic compaction is less likely. Lime takes time to react, to neutralize soil acids, and fall application allows greater acidity reduction prior to spring planting. Soil samples may be a bit difficult to take when the soil is dry (as is the case in much of Kentucky right now), but the benefits to early detection and correction of acid soils in your crop production fields can be very significant.

Soil acidity consists of acid cations, hydrogen (H^+), aluminum (Al^{3+}), and in some soils, manganese (Mn^{2+}). These acids are neutralized by basic anions, carbonate (CO_3^{2-}), hydroxyl (OH^-), and oxide (O^{2-}) provided by materials like agricultural, hydrated/slaked, and quick/burnt limes, respectively. Agricultural (ag) lime, consisting of different proportions of calcium and magnesium carbonates and crushed/ground to smaller particle sizes to speed acidity correction, is the material most often used to correct soil acidity in crop production fields. Rates of ag lime are found from measurements of acidity in your soil sample.

One important measure of soil acidity is soil pH, which is measured by electrodes placed in suspensions (Figure 1) of a portion of the soil sample in water or a simple salt solution (calcium chloride, $CaCl_2$, or potassium chloride, KCl). Salt solutions are more appropriate when drought results in fertilizer salt residues in fall soil samples, as is true this fall. This summer's drought was not uniform, statewide, and resulting fertilizer salt carryover is both significant and variable, causing lower and noisier than usual pH values in soil plus water suspensions. The University of Kentucky (UK) soil test lab determines soil pH in a suspension of soil and KCl solution that 'swamps' salt carryover differences in our samples. The KCl pH values are converted to water pH values using an equation: water pH = (0.91 x KCl pH) + 1.34.

Figure 1. Measurement of soil pH (photo courtesy UK Regulatory Services website).

The pH measured these suspensions is related to the hydrogen ion (H^+) activity of the soil-water system. The ***chemical*** definition of pH is that pH = - log(H^+). In other words, for a pH drop of 1 unit (e.g., from pH 6 to pH 5) there will be a ten-fold increase in H^+ activity in the soil solution. If pH rises by 1 unit, only one-tenth as much acidity will be present in the solution. As such, these pH measurements only determine the ***active acidity*** in the soil water solution bathing plant roots. This fraction of total soil acidity is extremely small. It would take less than a half-pound of calcitic lime per acre to neutralize the active acidity contained in the soil solution of 8 inches of pH 5 silt loam topsoil at field moisture.

The much, much larger portion of total soil acidity, termed ***potential (reserve) acidity***, resides on the surface of soil clay and organic matter particles. This particle surface acidity is in equilibrium with the solution active acidity, and the greater the clay or organic matter content, the greater the soil's ability to resist solution pH changes by either releasing or adsorbing H^+. This resistance is the soil's ***buffer capacity***. Soils with different textures (sandy vs. silty vs. clayey) can have the same level of active acidity, the same pH in soil plus water/ simple salt suspensions, but these soils will have very different quantities of potential/reserve acidity. This causes soil test labs to use another measurement approach to get at potential/reserve acidity, the buffer pH/ lime requirement test. Measurement of the soil potential/reserve acidity is done by suspending a portion of the soil sample in a chemical buffer solution that competes with the soil's buffer capacity and reacts with the particle surface acidity. The UK soil test lab uses the Sikora II buffer, which has a preset pH of 7.5. The lower the pH of the soil plus Sikora II buffer suspension, the greater the soil's potential/reserve acidity and the greater the lime requirement needed to neutralize that acidity.

Understanding your soil's acidity status is important. Soil pH can serve as a general indicator of soil nutrient availability, much like body temperature indicates general animal health. Soil pH values between 6.4 and 7.0 promote nodulation of legumes and the biological nitrogen fixation that sustains these crops. Low pH can slow biological mineralization of organic matter and crop residues, slowing release of organic nitrogen, phosphorus, and sulfur.

As soil acidity rises, soil pH falls and potentially toxic elements like manganese and aluminum become more soluble and available for plant uptake. Acid soils reduce the solubility and uptake of other nutrients, especially phosphorus and molybdenum. Surface soil acidity can reduce the effectiveness of triazine herbicides. Alkaline soils with excessively high soil pH values also often exhibit potential for nutrient stress. Deficiencies of zinc, manganese, and phosphorus have been observed on high pH soils in Kentucky. Boron, copper, and iron deficiencies have been reported in other states. Over-liming, whether due to excessive application rates or improper spreader operation, should be avoided.

Different crops have different soil pH needs. UK publication AGR-1 provides pH and lime information for many crops (AGR-1 Lime and Fertilizer Recommendations). Blueberries, potato, and azaleas grow well at lower soil pH values, tolerating the greater acidity and related chemical conditions. Corn and soybean require greater pH values and UK recommends lime to reach a target pH of 6.4 when the soil pH falls below 6.2 (see Table 6 from AGR-1 on next page).

Table 6. Rate of 100% effective limestone (tons/A) needed to raise soil pH to 6.4.

Water pH of Sample	Buffer pH of Sample								If Buffer pH is Unknown
	5.5	5.7	5.9	6.1	6.3	6.5	6.7	6.9	
4.5	4.50	4.25	4.00	3.50	3.00	2.50	2.00	1.50	2.75
4.7	4.50	4.25	4.00	3.50	3.00	2.50	2.00	1.50	2.75
4.9	4.50	4.25	3.75	3.25	2.75	2.25	1.75	1.25	2.75
5.1	4.50	4.25	3.75	3.25	2.75	2.25	1.75	1.25	2.75
5.3	4.50	4.25	3.75	3.25	2.50	2.00	1.50	1.00	2.25
5.5	4.50	4.25	3.50	3.00	2.50	2.00	1.50	1.00	2.00
5.7	4.50	4.00	3.50	2.75	2.25	1.75	1.25	1.00	1.75
5.9		4.00	3.25	2.50	2.00	1.50	1.00	0.75	1.25
6.1			2.75	2.00	1.50	1.00	0.75	0.50	1.00

Table 6 from Ritchey and McGrath. 2020. AGR-1, 2020-21 Lime and Nutrient Recommendations. Univ. Kentucky Cooperative Extension Service. Lexington, KY.

Finally, soil pH is rather slow to change, either up or down in our silt loam/silty clay loam soils. Don't expect soil pH to reach your target pH 6 months after application – it may take over a year. That said, taking soil samples every 2 to 3 years is adequate for monitoring this important soil health parameter.

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Cover Crop Establishment

This dry fall weather may be great for harvesting, but it's not ideal for establishing cover crops. Just like any other crop, cover crop seed needs moisture to establish and that is certainly in short supply this fall. There is some rain in the forecast over the next couple of weeks, and that will hopefully be enough to get cover crops (and our wheat) established. Even a moderate cover crop stand will protect soil from erosion, and bring additional benefits, over the winter and spring period. With limited moisture, and with seed costs being higher this year, how can you increase the odds of successful establishment?

First, when it's dry, cover crop establishment will be better if you can drill the seed. Planting the seed into the soil puts it in closer contact with moisture, which will aid in germination and emergence. Broadcasting seed onto dry soil is very risky, especially if there is not regular rain in the forecast. If you have to broadcast, try some vertical tillage or packing to improve seed-to-soil contact. (Remember, however, that tillage can dry out the soil and increase erosion.) Smaller seeds such as clovers need to be planted shallower for successful emergence, while seeds such as wheat and cereal rye can be planted deeper where there may be more moisture. These small grains may be better options in dry conditions. (Plus, see the next point – it's getting late for species other than wheat, cereal rye, or triticale!)

Second, make sure you're watching planting dates and optimal planting windows. Don't push them by planting species too late. Some species, like crimson clover, needs to reach a certain size to successful over-winter. If planted late and it stays dry, plants are unlikely to reach that size. University of Kentucky Cooperative Extension publication AGR-18 gives planting date windows for many common cover crop species. The Southern Cover Crops Council (www.southerncovercrops.org) also has multiple cover crop fact sheets, and information on planting, managing, and terminating cover crops.

Third, make sure your residual herbicide program won't interfere with the cover crop germination and establishment. The University of Wisconsin has a guide for this (https://ipcm.wisc.edu/download/pubsPM/2019_RotationalRestrictions_final.pdf); it outlines numerous pre-plant herbicides in corn and soybean, and whether damage might occur for different types of cover crops planted that same fall. Also see this newsletter article from Ohio State for a simpler table. (It gives names of herbicide active ingredients rather than products, but you can match your herbicide name to its active ingredient online.) *If you will graze these cover crops or harvest them for forage*, you MUST adhere to the rotational restrictions on the herbicide label.

As always, when choosing cover crops, consider your goals, as well as your location (soil and climate), your cropping system (when can you plant and when do you want to terminate), and available equipment. Goals for cover cropping may include reducing soil erosion or suppressing winter weeds (including marestail). In dry years, cash crops may not take up all the nutrients applied in the spring, so capturing these before they are lost may be an important goal for cover crop plantings this fall. When seed costs are high, consider the most economical species to accomplish your goals. If you're interested in learning more about cover crops, the Southern Cover Crops Council is hosting a conference in February 2023, in Baton Rouge! See the flier in this newsletter for more information, or contact me at erin.haramoto@uky.edu.

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SAVE THE DATE

Southern Cover Crops Council's conference will be held in Baton Rouge, LA in February 14 & 15, 2023. There is limited free registration for producers, on a first-come-first-served basis. See the site below for more information, including registration. You can also contact Erin Haramoto (erin.haramoto@uky.edu)

Southern Cover Crop Council

www.southerncovercrops.org

SCCC
Conference

February 14-15, 2023
Baton Rouge, LA

The SCCC Conference will provide farmers, crop consultants, extension agents, and other professionals with the latest information on cover crop management in the southern region

Register at
sites.google.com/ncsu.edu/sccconference2023/home

Soybean Podworm (a.k.a. Corn earworm) Damage on Soybeans

Helicoverpa zea (also known as the corn earworm, cotton bollworm and the tomato fruitworm) is a well-known pest of corn, cotton, tomato, hemp and, other crops including soybeans, where it can be a challenging pest, especially in the southern United States. Their preference for reproductive structures of the soybeans can impact yield, particularly when infestations occur during early reproductive plant growth stages.

Description of insect and damage

Although some soybean fields have been already harvested, there were soybean fields that had some maturing pods, or double crop fields have developing pods by mid-September when I observed caterpillars damaging pods in research plots at the University of Kentucky Research and Education Center. Even if not reported in commercial fields this year, the soybean podworm might had been feeding in maturing soybean pods without causing significant damages. Soybean podworm adults prefer to oviposit on hairy leaves even when larval development is best on smooth (glabrous) leaves (Lambert et al. 1992). Leaf hair morphology can also impact larval feeding damage, which is reduced on soybean with sharp tipped pubescence compared with those with blunt-tipped pubescence, however there is not a commercial cultivar developed for this purpose. In soybeans the most serious injuries happen when late larval stages (fifth or sixth instars) coincides with pods that are developing, and they eat away the pod wall and consume the seed (Figure 1); that potentially may reduce yields.

Figure 1. Soybean podworm damage of seed wall and in the process of feeding the bean. Photo by R.T. Villanueva.

Although, Figures 1 and 2 were taken on soybean pods taken from a research plot that is near corn planted late with purpose to have infestation of corn earworm; in some commercial soybean fields this happened, but I did not see or hear any reports. Usually, fifth (17.9 mm =0.7 in) and sixth (25 mm =1 in) instar larvae may start to do damage pods causing holes (Figure 2) on them. These large caterpillars are voracious and if outbreaks occur, they reduce soybean yields. Feeding by small caterpillars on terminals, flowers, and small pods does not reduce yield. However, occasionally large caterpillars will cause severe defoliation, but this damage rarely reduces yield.

Management

Planting time is the best resource to avoid soybean podworm damage. Usually, this pest is most frequently found in late planted fields. Double-crop soybeans may be more affected than full season. Proper planting is important as leaves may cover the plant canopy before bloom thus pods may be protected.

Control measures to reduce corn earworm damages should be conducted when an average of one small worm per foot of row is detected. The effects of insecticides for late larval stages is reduced, thus insecticide applications should be completed for small size larvae. Insecticide treatment to reduce corn earworm damage is recommended if 5 to 10% or more of the soybean pods exhibit feeding damage from soybean podworm larvae.

Figure 2. Holes caused by the feeding of soybean pods. Photo by R.T. Villanueva.

More information:

ENTFACT-144: Soybean Podworm in Kentucky Soybean,

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University of Kentucky 2022 Crop Pest Management Webinar Series begins in November

Information regarding your pest management questions is just a few mouse clicks away. As offered in previous years, the University of Kentucky has once again organized five webinars on field crop protection topics that will be hosted through the Southern Integrated Pest Management Center beginning on Nov. 8, 2022. The weekly webinars will feature University of Kentucky Extension Specialists speaking on topics ranging from Weed Science, Plant Pathology and Entomology.

Credits have been applied for regarding Kentucky Pesticide Applicator credits and Certified Crop Advisor continuing education. Pre-registration for the webinars is required through the registration URL provided. Dates, speakers and registration links are listed below. All webinars will begin at 10 a.m. EST/ 9 a.m. CST, on the Tuesday morning listed. For more information contact Jason Travis, Agricultural Extension Associate for the University of Kentucky, at (859) 562 -2569 or by email at jason.travis@uky.edu.

Webinar #1
Date: November 8, 2022
Speaker: Dr. JD Green
Title: Weed Control Lessons Learned From the 2022 Crop Season
Registration URL: https://zoom.us/webinar/register/WN_4JQovXYvR76AZXp_tSmBwg

Webinar #2
Date: November 15, 2022
Speaker: Dr. Carl Bradley
Title: Managing Important Soilborne Diseases of Soybean in Kentucky
Registration URL: https://zoom.us/webinar/register/WN_t6D6toO8Sh2BhyoD3iw1HQ

Webinar #3
Date: November 22, 2022
Speaker: Dr. Travis Legleiter
Title: Implementing Defensive Shifts Against Problematic Kentucky Weeds
Registration URL: https://zoom.us/webinar/register/WN_QnugWPJJQUynBXDf4io9zg

Webinar #4
Date: December 6, 2022
Speaker: Dr. Kiersten A. Wise
Title: Corn Disease Management Questions Asked in 2022
Registration URL: https://zoom.us/webinar/register/WN_KwibLTsHQY6oJjiKzURCEQ

Webinar #5
Date: December 13, 2022
Speaker: Dr. Raul Villanueva
Title: Entomological Studies in Corn and Soybeans Under Difficult Circumstances (Covid, and Tornado and Drought) in 2022
Registration URL: https://zoom.us/webinar/register/WN_3KVwBMYKQYKnxzW1K-A0-g

The Leafminer *Macrosaccus morrisella* Reported as a New Pest of Soybeans in Minnesota and Quebec

In Québec (Canada), white-colored blotch-type leaf mines were observed in soybean fields since August 2016 whereas, in Minnesota (United States), leaf mines similar to those in Québec were observed in soybean fields in August 2021. In 2022, a larger presence of similar leaf mines were reported in southern Minnesota by Dr. R. Koch (University of Minnesota).

The mine caused by *M. morrisella* begins as an elongate serpentine track on the abaxial (lower) side of the leaflet, mine enlarges to an elongate-oval, whitish blotch which eventually becomes strongly tentiform' (Figure 1). The adaxial (upper) surface of the mine sometimes was slightly raised (i.e., tentiform). A leaflet can have more than one mines, and mines in soybean did not cross the midribs or main lateral veins of the leaves, and one or more margins of individual mines were often defined by the midrib or lateral veins.

Figure 1. Blotch-type leaf mines caused by *M morrisella*. Photos by R. L. Koch, Univ. of Minnesota.

ID, hosts, and distribution of this new pest

The adult moths are small microlepidopterans measuring 6–7 mm, with front wings that have orange, white and gray-black markings (Figure 2). Larvae reach about 4.7 mm in length and have five larval instars, and are pale green, whereas the pupae are about 3.6 mm in length. *Macrosaccus morrisella* is known to feed on American hogpeanut, and sickleseed fuzzybean, which are both vining plants with trifoliate leaves such as soybeans. *Macrosaccus morrisella* is a native insect of the US that apparently has adapted to feed on soybeans a plant of exotic origin in the US.

This species is widely distributed in the US, including, Kentucky. However, the reports on this type of damages have not been observed in Kentucky yet. In the past, three species of chrysomelid beetles have been reported feeding on soybeans in the US but they do not have a significant impact on soybean production. How-

ever, there are several moth species in Africa, Asia, and Australia that are significant pest on soybeans. Species in the genus *Macrosaccus* spp. are known to feed on native plants of the Fabaceae (soybeans are in this family) and probably the process of evolutionary adaptation to switch to soybeans is happening nowadays, although this needs further evaluation.

Figure 2. Adult *Macrosaccus morrisella* can be 6 to 7 mm in length with orange, white and black patterns. Photo by R. L. Koch, Univ. of Minnesota.

More Information

- Davis and De Prins (2011). Systematics and biology of the new genus Macrosaccus with descriptions of two new species (Lepidoptera, Gracillariidae)
- Koch, Moisan-De Serres and Ribeiro (2021). First Reports of Macrosaccus morrisella (Lepidoptera: Gracillariidae) Feeding on Soybean, Glycine max (Fabales: Fabaceae)
- Minnesota Crop News Blog. Updates on a new leaf-mining pest of soybean in Minnesota

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SAVE THE DATE

2023 Kentucky Crop Health Conference

Agricultural Pest Management Conference @ The National Corvette Museum

350 Corvette Dr. • Bowling Green, Ky. 42101

University of Kentucky
College of Agriculture, Food and Environment

February 9, 2023
9 a.m. to 5 p.m. CST

National Corvette Museum

Registration opens Nov 1. 2022
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UPCOMING EVENTS

Nov 8, 2022	UK 2022 Crop Pest Management Webinar Series Weed Control Lessons Learned From the 2022 Crop Season
Nov 15, 2022	UK 2022 Crop Pest Management Webinar Series Managing Important Soilborne Diseases of Soybean in Kentucky
Nov 22, 2022	UK 2022 Crop Pest Management Webinar Series Implementing Defensive Shifts Against Problematic Kentucky Weeds
Dec 6, 2022	UK 2022 Crop Pest Management Webinar Series Corn Disease Management Questions Asked in 2022
Dec 13, 2022	UK 2022 Crop Pest Management Webinar Series Entomological Studies in Corn & Soybeans Under Difficult Circumstances (Covid, a Tornado & Drought) in 2022
Jan 5, 2023	**UK Winter Wheat Meeting**
Jan 19, 2023	KY Commodity Conference - Bowling Green
Feb 23, 2023	KATS In-depth Mode of Action
March 9, 2023	KATS Soil Fertility and Assessment
March 9-11, 2023	National Commodity Classic - Orlando FL
May 09, 2023	**UK Wheat Field Day**
May 18, 2023	KATS Crop Scouting Clinic
June 7-8, 2023	KATS Drone Pilot Certification Prep Course
July 13, 2023	KATS Spray Clinic
Jul 25, 2023	**UK Corn, Soybean and Tobacco Field Day**

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