

Hybrid Pearl Millet as an Alternative to Sugarcane Aphid-Susceptible Sorghum Family Forages

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*With the widespread presence of sugarcane aphid in Texas in 2014, and the expectation that this pest will also be a threat in 2015 to Texas sorghums—grain, forage sorghum, sorghum/sudan, etc.—growers needing annual forage and grazing may have another option that appears to be unaffected by sugarcane aphid. **Hybrid pearl millet (HPM)** is a leafy forage that may have a fit in some grazing and haying operations.*

Current Issues with Sorghum Family Forages & Potential Sugarcane Aphid Damage

In some areas of Texas sorghum family forages, in particular sorghum/sudan (also commonly known as ‘haygrazer’), are common annual forage choices for grazing and haying. But since sugarcane aphid (SCA) underwent a change in preference for feeding and reproduction in 2013, we have seen many sorghum fields—forage or grain—suffer moderate to significant damage from SCA (Fig. 1). This insect reproduces very fast, even doubling in as little as five days when conditions are favorable, and can devastate a forage or grain crop of sorghum in a few weeks.



Fig. 1. Sorghum/sudan in central Texas that has been hit heavily by sugarcane aphid (2014). Loss of leaf matter has significantly reduced forage production, and SCA activity has even killed some plants. (Photo: Texas A&M AgriLife, staff unknown).

There are two insecticides specifically labeled for sugarcane aphid control in sorghum family forages. These are ‘Transform’ (active ingredient *sulfoxaflor*, Dow AgroSciences) and ‘Sivanto’ (active ingredient *flupyradifuron*, Bayer CropScience)†. Treatment thresholds for labeled rates of either insecticide have been determined for grain sorghum in Texas, however, though both chemicals are labeled for use in sorghum family forages (with accompanying chemical application rates), treatment thresholds have not been determined for sorghum forages. Both Transform and Sivanto have a 7-day restriction on haying or grazing after application, meaning that grazing and mowing for hay are not allowed within seven days of application, and cattle must be removed from the field.

Forage growers may be reluctant to apply an insecticide for sugarcane aphid due to the cost of the application relative to crop value and may not be equipped to spray for SCA. Also, control of SCA with insecticides requires good coverage of the entire canopy, including lower leaves, which is difficult to achieve in forage sorghum due to the dense canopy and especially if the crop is tall. For these reasons, early harvest or flash (mob) grazing may be the best option if SCA numbers and leaf damage are increasing in forage sorghums. However, the SCA infestations will likely persist in the field following grazing or harvest and increase on young, tender forage regrowth. If a second cutting is desired, the field should again be scouted once a week to determine if the infestation threatens the crop.

Sorghum forages infested by SCA and the honeydew excreted by SCA are not harmful to livestock. However, a black sooty mold can grow on the honeydew deposits and as a result, leaves can appear black in fields heavily infested with SCA. This black mold may contribute to reduced palatability of the forage.

Hybrid Pearl Millet—A Poor Host of Sugarcane Aphid

Field observations in several Texas areas in 2014 by producers, AgriLife extension agents, millet breeders, entomologists, did not find SCA in hybrid pearl millet (HPM). This does not mean that SCA can’t be found in millets, but it appears that these aphids find HPM an unsatisfactory host, and they do not significantly increase their numbers while on HPM nor is damage expected.

Though further field observations are needed, testing of SCA preference on numerous forages other than sorghum—including hybrid pearl millet—has been conducted by Dr. Scott Armstrong, USDA-ARS entomologist, Stillwater, OK. In these tests ten sugarcane aphids are introduced to each seedling of different forages and the aphid numbers were recorded 25 days later. Greenhouse test results in April 2015 reveal that hybrid pearl millets experienced only minor damage if any. Ratings are conducted on a scale from 1 = no damage to 9 = dead plants; composite scores of 1 to 3 are considered ‘Resistant,’ 4 to 6 is ‘Moderately Resistant,’ and 7 to 9 is ‘Susceptible.’ Four of five HPMs were rated as Resistant (score of 1.0 to 2.8) and one HPM entry was rated as Moderately Resistant (score 3.5). { *Caution:* Resistance ratings do not mean immunity, a mistaken assumption that farmers and others may make. }

Based on this data—as well 2014 field observations in Texas when SCA was common and even damaging in nearby sorghum family forages as well as Johnsongrass—Dr. Armstrong concludes that HPM is a **poor host** to SCA. Should SCA be present in HPM, Dr. Armstrong expects that populations would only increase slowly, allowing time for beneficial insects to also reduce SCA numbers. He does not anticipate that SCA would increase to damaging levels in HPM, but recommends that SCA densities be monitored weekly—just like sorghum family forages—in fields planted to HPM so management action can be taken should SCA damage increase.

Are there other millets suitable for forage production?

Yes. Proso millet and foxtail (German) millet are also used for forage production, but their forage yield potential is much less than HPM. Proso millet is mostly used for grain whereas foxtail millet is a relatively short-season crop (as little as 60 days), and is not generally recommended for grazing. The same greenhouse studies by USDA-ARS noted above found that two proso millets had no SCA damage (score of 1.0) thus Dr. Armstrong concluded that proso millet is also a poor host for SCA, possibly even more so than HPM. Foxtail millet has not yet been tested by USDA. It has hairy characteristics on the leaf and lower stem similar to proso millet which may make SCA reproduction more difficult. Thus this millet species may not be expected to have significant SCA damage, but USDA testing and field results are needed to quantify SCA activity (or lack thereof) on this millet species.

Basic Suggestions for Hybrid Pearl Millet Production

Hybrid pearl millet is a leafy forage with a leaf-stem ratio generally greater than 1:1 (whereas sorghum/sudan is normally less than 1:1) {Figures 2 & 3}. Growers in Central and South Texas where HPM has been rarely used may find in 2015 that planting a small portion of their acreage may be a possible approach as they explore this possible forage, at least until SCA-resistant sorghums are available. Whether you plant 5 acres of 500 acres, factors that may influence your consideration of HPM will include: 1) the agronomics of HPM (see below), 2) the potential adaptation to your farm, and 3) the risk that SCA may present to essential forage production from sorghums.

As noted earlier hay and forage growers, especially on smaller acreages of sorghum forages, may be less willing or less able to spray for sugarcane aphid if SCA damage appears. This could be particularly damaging to a forage crop as leaf area is lost thus making HPM more attractive for growers even if forage yield potential may be somewhat lower which is typically the case unless there are high soil pH conditions that limit iron nutrition of sorghums or drought conditions where HPM is even more drought tolerant than sorghum/sudan.

For a more comprehensive guide on millets including HPM and their production, consult the references for Marsalis et al., 2012, listed below, which discusses all millets for production in New Mexico and West Texas.



Figures 2 & 3. Hybrid pearl millet production at Tucumcari, NM, and Plainview, TX (right; this crop was planted on 40" rows). Note the characteristic leafiness of HPM on the right. Typical seed heads are emerging, but optimum forage quality with modest forage production should seek to graze and bale before head emergence. (Fig. 2, courtesy NMSU; Fig. 3, AgriLife Extension.)

Recent AgriLife Observations for Hybrid Pearl Millet in Central Texas

- Millet seems to perform better on sandier soils
- How millet may perform on Blackland soils is unknown
- Millet tends to have less forage production potential than the sorghums
- Observations of how millet performs in high pH soils were absent, specifically we have no direct reports of millet and presence of iron deficiency on these soils, which is a common problems for sorghums.

Characteristics of Hybrid Pearl Millet as an Annual Forage

- Hybrid pearl millet is a very leafy forage, more so than sorghums.
- Early planting of millet into cool soils is not advised as soil temperatures need to be near 70°F for good establishment (this is 5 to 10° warmer than that for sorghums).
- Millets may not persist as long into the fall and cool conditions as sorghums.
- Millets are best adapted to sandier soils, but may perform well on medium-textured soils as well.

- Though HPM grows best at soil pH of 6 to 7, this millet can perform well at higher soil pH and certainly tolerates high pH soils better than sorghum family forages due to a different iron uptake mechanism. Though conditions associated with alkali or heavy caliche will restrict HPM growth the nemesis of much sorghum production in high pH soil, interveinal iron chlorosis, is significantly reduced and often a non-issue with HPM. As these soil conditions worsen, HPM will gradually outperform sorghums.
- Millets are safely fed to horses, unlike sorghum family forages.
- Millet is not susceptible to prussic acid development—it is not a member of the sorghum family—in summer drought/regrowth and fall frost situations.
- All millets may accumulate nitrates like the sorghums.
- Millet is small seeded (70,000 to 90,000 seeds per lb.), one-fourth to one-fifth that of most sorghums thus it can't be planted as deep.
- Grazing of HPM is less common due to greater sensitivity of the forage to heavy hoof traffic. It should not be grazed down as hard as sorghum/sudan can be.
- When mowing or swathing HPM for hay, leave about 2" more stubble height (total ~6") than you would for sorghums in order to better drive regrowth.
- A few brown mid-rib (BMR) hybrid pearl millets are on the market, and these hybrids are generally lower in lignin thus potentially have higher feed value.
- Foxtail (German) millet and proso millet are not likely replacements for some sorghum forage acres. The former is a short maturity, lower yielding forage, and proso is best suited for contract grain production.

Agronomic Considerations for Hybrid Pearl Millet Production

Below we note several key considerations for potential HPM production, particularly in Central, East, and South Texas where millet production has been rare. Since millet production knowledge is limited in Texas other than the High Plains there is some unfamiliarity with the crop and how it may perform in other areas of the state.

- As noted above HPM can't be planted as early due to low germination in cool conditions, but as of mid-May 2015 temperatures are warm enough to seed HPM anywhere in Texas.
- What about weed control? Millet has few labeled herbicides. The primary label for pre-plant broadleaf control is mesotrione (Callisto); main crop rotation limitations for this herbicide are four months for small grains and ten months for cotton. Unlike sorghums, atrazine is not labeled pre-emerge or post-emerged for millet. A few options for post-merge broadleaf weed control are available (see Marsalis et al., 2012), but like the sorghums there are no options for POST grass control in millets. A particular note with regards to 2,4-D: though labeled for HPM, do not spray in early growth stages (up to a month?) and use low rates. (Some industry staff do not recommend 2,4-D at all, but Banvel will work well in lieu of 2,4-D.)
- With small seed size, HPM should not be planted as deep as sorghums, which can be a limitation if soils are dry.

- Seeding rates for HPM should be reduced from what you would normally use for sorghum/sudans. In central, east, and south Texas consider 10-15 lbs./A (Corriher, 2012), and similar rates for irrigated HPM in the High Plains (but about half the rate for dryland in West Texas). Higher seeding rates are generally preferred for hay production in contrast to grazing.
- Millet is typically drilled just like sorghums. In low rainfall areas of Texas HPM may be planted (Fig. 3) with good results if using a planter may better enable establishment by reaching adequate moisture. Older drills that are worn out might have trouble seeding lower rates of 10 lbs. or lower per acre.
- Fertility needs for millet will be similar to sorghum forages (see Marsalis et al., 2012).
- Forage quality—whether in grazing or in baling—follows similar trends found in sorghums. For optimum haying consider boot stage as a good balance between tonnage and feed value.
- If you plant HPM millet for the first time, walk your field(s). Become familiar with the plant. Cut the stems to find the growing point, dig up plants at different stages and look at the roots, watch how millet tillers during regular production as well as the regrowth after cutting or grazing.

Bottom Line—Hybrid Pearl Millet as an Option against Sugarcane Aphid

There are several questions about HPM and how it may perform further east and south in Texas, but it does present an annual forage option for hay and grazing to Texas producers. If you are concerned about SCA in sorghum family forages, you may consider planting a bag of different HPM hybrids (e.g., most HPMs in Texas are shorter in growth habit, which is common of the ‘Tifleaf’ hybrids but a few non-Tifleaf hybrids are taller in growth though not necessarily higher in forage production) and try them on your farm. At a minimum if SCA becomes prevalent and widely damaging you will have some forage that should be safe from the level of damage seen in sorghums.

If you lose some sorghum forage earlier in the season, you might consider replanting some HPM millet later in the season perhaps even into July.

Will sugarcane aphid tolerant/resistant sorghum family forages be available in the near future?

As of early 2015 there are no commercial forages like sorghum/sudan, sudangrass, sorgo/sudan, or haygrazer that have been publicly identified as tolerant to sugarcane aphid. This might change soon if commercial companies have forage lines that are found to produce well in the presence of sugarcane aphid—any such sorghum forage would need independent confirmation. There are parent lines in the sorghum family (e.g., Tx2783, etc.) that are available to commercial companies that may confer resistance through a breeding program, much like has occurred with a few tolerant grain sorghum hybrids. When might this occur? That is difficult to say but Texas A&M AgriLife sorghum breeders have indicated that SCA-resistant germplasm is dominant when crossed with non-resistant sorghum lines. Once initial crosses are made it could take a

couple of years to produce and test a commercially viable sorghum for forage use that is resistant to SCA.

For additional information about hybrid pearl millet management consult:

Central, East, and South Texas: “Warm-season annual forage grasses for Texas” (2012), E-630, Texas A&M AgriLife Extension Service (V.A. **Corriher**),
<http://foragefax.tamu.edu/files/2013/05/WSAForagesforTexas.pdf>

West Texas: “Millets for Forage and Grain in New Mexico and West Texas” (2012), A-417, New Mexico Cooperative Extension Service (M.A. **Marsalis**, L.M. Lauriault, C. Trostle),
<http://lubbock.tamu.edu/files/2012/07/Millets-for-NM-West-TX-2012-A-417.pdf>

To track current Texas information on sugarcane aphid activity:

<http://txscan.blogspot.com/> This link also includes current-year SCA distribution maps as well as sugarcane aphid resources including control measures. For forage growers using sorghum family forages consult SCA management and control strategies listed in “The sugarcane aphid: A new pest of grain and forage sorghum,”
<http://lubbock.tamu.edu/files/2015/05/SCA-Management-Guide.pdf>

†Mention of any particular product name is not an endorsement by Texas A&M AgriLife Extension Service.

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