



# Warm-Season Cover Crops for High Tunnels in the Southeast

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High tunnels (HTs) can provide for year-round production in our region, but soil quality can suffer with back-to-back planting of cash crops. Adding cover crops into the rotation can provide many benefits, including adding organic matter and nitrogen and suppressing weeds. The timing and cover crop selection, however, can vary from field crop production. In the Southeastern region, there is typically a six- to eight-week window in summer that provides a good opportunity to grow a cover crop before fall cash crop plantings. Based on trials in Kentucky, Tennessee and Georgia, and on other investigations, this publication outlines several warm-season cover crops that may be used in HTs in the Southeast, along with their benefits and challenges. This fact sheet complements an introduction to cover crops in high tunnels ([Covers Under Cover: Managing Cover Crops in High Tunnels; CCD-SP-16](#)); cool-season cover crops are reviewed in fact sheet number [CCD-SP-18](#).

*Selecting the right warm-season cover crop for you.* Determine what you want the cover crop to do for your production system. Some cover crops will add nitrogen to the system, while others may produce a lot of biomass in a short period of time and add organic matter to the soil. Ensuring adequate time in the rotation for both cover crop growth and decomposition is an important consideration that is discussed in greater detail below (see *Termination* section). Summer can be a great time to include a cover crop in a high tunnel rotation, but being mindful

of heat and drought tolerance, as well as the quantity of biomass produced is key to summer cover crop success. Finally, consider what crop will follow the cover crop and what equipment you have available for termination and incorporation. For example, if you have a long growing window but will direct seed a small-seeded cash crop and have limited equipment for incorporation, you may want a slow-growing cover crop that will not accumulate much biomass. To aid in decision-making, Table 1 (Page 4) contains a description of the general traits, benefits and challenges of some specific cover crops that we have worked with in HTs. Table 2 (Pages 5 and 6) gives seeding rates and other general information about the cover crop species listed in Table 1, along with other varietal suggestions, but is not an exhaustive list.

*Planting and establishment.* Warm-season cover crops can be planted as soon as the risk of frost in the high tunnel has passed, generally one month prior to the open field. If the HT temperature is still low and sunlight is limited, establishment may be slower. Planting in the peak heat of the summer, however, may also lead to reduced establishment of some species. Ensuring seeds have good soil contact, and that the seedbed remains moist during germination and early growth, is key to growing a good cover crop stand.

*Managing growth.* Growing a cover crop during the summer months is a great way to get rapid cover crop growth in a short window of time. Typically, warm-season



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cover crops are tolerant of high soil temperatures, and they will grow most rapidly when the weather is consistently warm and there is ample sunlight. However, this also means that soils dry out more rapidly than in cooler weather so irrigation is critical. In our trials on our research farms and with producers, we have seen some cover crops reach peak biomass in four weeks. With this rapid growth, it is very important to regularly check cover crops to make sure they are not growing too large to be managed by whatever method is going to be used to terminate the cover crop.

*Termination timing and methods.* Leaving adequate time for cover crop residue decomposition is important to ensure the success of the next cash crop. This is particularly critical if the cover crop produces a lot of biomass, and/or if that biomass has a lot of carbon relative to nitrogen – these factors will lead to slower cover crop decomposition. In general, more mature cover crops take longer to decompose. High carbon cover crops, including grasses, can immobilize nutrients as they decompose. Some legumes, including sunn hems, can also become woody as they mature and this will also slow the decomposition process and make incorporation more difficult. So, if cover crops are being grown in limited time windows, or if the biomass is very vigorous, it may be necessary to terminate a cover crop prior to peak biomass to allow time for decomposition. To ensure cover crops are effectively terminated, it may be necessary to mow very close to the soil surface, wait at least a day or two for the biomass to dry, and then till in the cover crop residue. The beds should be monitored and tilled again as needed for any regrowth. Irrigation and warmer HT temperatures will accelerate decomposition. As a general rule, allow yourself one to two weeks after cover crops are incorporated before you plant your next cash crop. If smaller-seeded crops are direct seeded, wait longer; most transplants can be planted earlier. Rake remaining cover crop residue out of the beds before planting, or give it more time to decompose.

*Considering plant-parasitic nematodes.* When choosing a warm-season cover crop for your HT rotation it is important to investigate if plant-parasitic nematodes are a problem in your area. Southern root-knot nematode (*Meloidogyne incognita*; RKN) is a common plant parasite that infects and feeds on plant roots. As a result of the feeding, plant roots form galls, or knots.

The feeding reduces a crop's ability to take up nutrients and water, which can decrease subsequent crop yields and even lead to plant death. If RKN infects root crops, this can also affect marketability of the crop. Knowing the host suitability of a particular cover crop is useful because it can help indicate whether the RKN population is likely to increase, decrease or stay the same when in the presence of the cover crop. If a cover crop is a good host for a plant-parasitic nematode, that nematode population is likely to increase during the cover crop's lifecycle, which is not good. Being a poor host indicates that the nematode does not easily infect and reproduce in the presence of that cover crop and the specific nematode population (not all nematodes) will likely decrease. Your local Cooperative Extension Service or plant diagnostic laboratory can help you determine if these plant-parasitic nematodes are present in your soil. If you know you have RKN in your soil, you should avoid planting crops and cover crops that are known hosts for RKN. Keep in mind that different cultivars within a cover crop species can have different levels of host suitability (for example, 'Chinese Red' cowpea is a poor host, but 'Iron Clay' cowpea is a good host). When soil temperatures are 80°F, RKN can complete one lifecycle in approximately 25 days. High tunnel soils will likely be at or around that temperature in the summer months. When environmental conditions, such as temperature, are conducive to RKN reproduction, it is even more important to select a non-host cover crop.

## Cover Crop Seed Sources

Albert Lea Seed (Albert Lea, Minnesota)

Website: <https://www.alseed.com>

Phone: (800) 352-5247

Center Seeds (Sidney, Ohio)

Website: <https://centerseeds.com/>

Phone: (855) 667-3943

Johnny's Selected Seeds (Winslow, Maine)

Website: [www.johnnyseeds.com](http://www.johnnyseeds.com)

Phone: (877) 564-6697

Seven Springs Farm (Check, Virginia)

Website: [www.7springsfarm.com](http://www.7springsfarm.com)

Phone: (800) 540-9181

Petcher Seeds (Fruitdale, Alabama)

Website: [www.petcherseeds.com](http://www.petcherseeds.com)

Phone: (251) 827-6594

Southern Exposure Seed Exchange (Mineral, Virginia)

Website: [www.southernexposure.com](http://www.southernexposure.com)

Phone: (540) 894-9480

Hancock Seed Company (Dade City, Florida)

Website: [www.hancockseed.com](http://www.hancockseed.com)

Phone: (800) 552-1027



## Cover Crop Resources

Managing Cover Crops Profitably

(free download from USDA-SARE):

<https://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition>

Southern Cover Crops Council

Website: [www.southerncovercrops.org](http://www.southerncovercrops.org)

Midwest Cover Crops Council

Website: [www.mccc.msu.edu](http://www.mccc.msu.edu)

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*Photos courtesy of Erin Haramoto, University of Kentucky*




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Table 1. A sampling of cover crops varieties tested in high tunnels and their traits.

Cover Crop	Traits						Tolerance			Comments
	N Fixing	N Scavenging	Soil Builder	Weed Suppression	Quick Growth	Host for Southern root-knot nematode*	Heat	Drought	Low Fertility	
<b>Cowpea, Chinese Red</b>	Yes	Fair	Fair	Fair	Good	Yes	Very Good	Very Good	Very Good	More vining habit and earlier to mature than Iron and Clay.
<b>Cowpea, Iron and Clay</b>	Yes	Fair	Good	Fair	Good	No	Very Good	Very Good	Very Good	Blend of a bush and vining varieties. Rapidly maturing; however, vining plants keep growing even as seeds mature, giving later biomass. Heat and drought tolerant once germinated.
<b>Millet, German</b>	No	Good	Fair	Good	Excellent	Unknown	Very Good	Good	Poor	Matures a few weeks later than Japanese millet.
<b>Millet, Japanese</b>	No	Good	Good	Good	Excellent	Yes	Very Good	Good	Poor	Rapidly maturing after initial establishment.
<b>Sesame</b>	No	Unknown	Excellent	Very Good	Fair	No	Excellent	Excellent	Unknown	Tolerates high heat, breaks down quickly.
<b>Sunn Hemp, various cultivars</b>	Yes	Very Good	Very Good	Good	Fair	No	Excellent	Very Good	Very Good	Prone to rodent and rabbit damage, can be difficult to establish. Very drought tolerant and rapid growth.
<b>Teosinte</b>	No	Good	Excellent	Excellent	Unknown	Unknown	Excellent	Very Good	Unknown	Less biomass than a sorghum-sudan crop. Excellent weed suppression.

\*See *Considering plant-parasitic nematodes* on Page 2.

Table 2. Seeding rates, potential benefits and challenges for the warm-season cover crop species listed in Table 1. For some species, other varieties are suggested, but the variety recommendations are not meant to be exhaustive.

<p><b>Cowpea</b></p> <ul style="list-style-type: none"> <li>• Seeding rate: 100-150 lbs/ac (2.25-3.5 lbs/1000 ft<sup>2</sup>) broadcast</li> <li>• Potential benefits: <ul style="list-style-type: none"> <li>• Fixes N</li> <li>• Decomposes rapidly</li> <li>• Low water use</li> <li>• Saline tolerant</li> <li>• Quickly shades out weeds</li> <li>• Easy to establish (except for Iron &amp; Clay, which is slower than other cowpea)</li> <li>• Iron &amp; Clay are poor hosts for Southern root-knot nematode</li> </ul> </li> <li>• Challenges: <ul style="list-style-type: none"> <li>• Chinese Red is host for Southern root-knot nematode</li> <li>• Nematode host status is variety dependent; be sure to check this if nematodes are a problem in your HT!</li> <li>• Has some hard seededness – not all may germinate soon after planting and will “volunteer” in subsequent seasons</li> </ul> </li> </ul>	
<p><b>Millet, German</b></p> <ul style="list-style-type: none"> <li>• Seeding rate: 20 lbs/A (0.5 lbs/1000ft<sup>2</sup>) broadcast</li> <li>• Potential benefits: <ul style="list-style-type: none"> <li>• Low water use</li> <li>• High biomass</li> <li>• Matures a little later than Japanese millet (7-10 days later in the summer)</li> </ul> </li> <li>• Challenges: <ul style="list-style-type: none"> <li>• Host for Northern root-knot nematode</li> <li>• Host status for Southern root-knot nematode is unknown</li> </ul> </li> </ul>	
<p><b>Millet, Japanese</b></p> <ul style="list-style-type: none"> <li>• Seeding rate: 25-30 lbs/ac (0.6-0.7 lbs/1000ft<sup>2</sup>) broadcast</li> <li>• Potential benefits: <ul style="list-style-type: none"> <li>• Low water use; high heat and drought tolerance</li> <li>• Rapid growth and maturity</li> <li>• High biomass (but less than German)</li> <li>• Weed suppression</li> <li>• Rapid summer growth (matures in 45 days)</li> <li>• Can have vigorous re-growth with mowing</li> <li>• Pairs well with cowpea</li> </ul> </li> <li>• Challenges: <ul style="list-style-type: none"> <li>• Also called “million seed plant;” terminate before seed set</li> <li>• Host for Southern root-knot nematode (and other species of RKN)</li> </ul> </li> </ul>	

### Sesame

- Seeding rate: 6-10 lbs/ac (2.25 – 3.75 ounces/1000 ft<sup>2</sup>) broadcast
- Potential benefits:
  - Quick growth once established
  - High biomass
  - Weed suppression
  - Quick decomposition
  - Not a host for Southern root-knot nematode
  - Not a common plant family
- Challenges:
  - Does not tolerate wet soils



### Sunn Hemp

- Seeding rate: 20-40 lbs/A (0.5-1 lb/1000 ft<sup>2</sup>) broadcast
- Potential benefits:
  - Fixes N
  - Low water use
  - High biomass
  - Deep taproot
  - Poor host for Southern root-knot nematode
- Challenges:
  - Can produce a lot of biomass! Woody stems can result, making termination and incorporation more difficult



### Teosinte

- Seeding rate: 25 lbs/A (0.6 lbs/1000 ft<sup>2</sup>) broadcast
- Potential benefits:
  - High biomass
  - Weed suppression
- Challenges:
  - Can produce a lot of high C biomass
  - Plant-parasitic nematode host status is unknown

