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Austrian Winter Pea as a Winter Cover Crop

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Introduction

Austrian winter pea ([AWP] Pisum sativum arvense) is a cool-season legume that is well-suited for Arkansas production systems due to its climate adaptability and performance in a wide range of soil textures. Typical growth pattern for AWP is similar to winter wheat (Triticum aestivum) in the sense that it will germinate and establish in the fall and grow until winter ambient air temperatures drop near freezing. When air temperatures cool, AWP will go dormant and will not resume growth until February or until air temperatures rise to sufficient levels.

In most cases the name of the game for cover crop success is biomass production. Austrian winter pea has broad adaptability and works well on most soil textures including marginal or unproductive soils. One characteristic of AWP that allows it to thrive in Arkansas is its ability to withstand waterlogged soils and even some ponded water. In addition, AWP can germinate at very low soil temperatures (~41° F), allowing it to be planted and established late in the fall after crops such as late-planted soybean (Glycine max) have been harvested.

Seed cost for AWP can reach $25-30 per acre depending on seeding rate, and can have a higher seed cost per acre than other cover crop species. Producers should keep in mind that AWP is great for erosion control and weed suppression, but also provides N credits that can be counted towards the following crop's season total nitrogen (N) rate. A typical AWP crop terminated in mid-March can provide 50-60 lb N/acre, whereas an AWP crop at first bloom (mid to late April) can provide >150 lb N/acre. Although the seed cost may seem high, the N credits gained can be worth as much as $30-60 per acre of N fertilizer savings.

Austrian winter pea can be included in many cover crop blends and is probably more appropriate to use than clovers, due to its ease of establishment and wide adaptability. In areas where winter cereals are planted to aid in erosion control and weed suppression, AWP can be added to help lower the C:N ratio of the winter cereal and aid in residue breakdown and release of nutrients from the cereal biomass.

Crop Rotations for Austrian Winter Pea

Considering the cash crop that will be planted the following spring is the first step in developing an effective winter cover crop management plan. Having a good understanding of what you are trying to accomplish with your winter cover crops is essential to picking the right one for your farm, your soil and your crop rotation. Austrian winter pea is an excellent N source and can provide a significant amount of N credits that can be counted towards the following crop's N requirements. The N credits supplied by AWP can be great for cereal cash crops like corn (Zea mays), rice (Oryza sativa) and grain sorghum (Sorghum bicolor), but not as good a fit for legume cash crops like soybean or peanuts (Arachis hypogaea).

When planting cereal crops that have large N requirements like rice and corn, AWP can supply >100 lb N/acre if allowed to grow to first bloom in the spring and not incorporated through tillage. However, for legume cash crops like soybean, the residual N that is generated by AWP has the potential to reduce or prevent nodulation and limit soybean productivity. An additional concern for planting soybean after AWP is the potential for increased nematode and insect pressure, as they are both legumes and host similar nematode species.

Land Preparation

Similar to other cover crops, the primary benefits of erosion control, water retention and weed suppression can only truly be realized if the majority of the cover crop biomass remains on the soil surface following termination. Therefore, the goal should be to complete all land preparation for the summer cash crop before fall planting and establishment of AWP with the intent of burning down the AWP cover crop with herbicide, and establishing the summer cash crop using no-till planting techniques.

Cover Crop Benefit	Relative Rating†
Nitrogen Source	Very good
Nutrient Scavenger	Fair
Soil Builder (Organic Matter)	Average
Topsoil Loosener	Very good
Subsoil Loosener	Fair
Erosion Preventer	Average
Weed Suppression	Average
Lasting Residue	Fair

†- Relative Cover Crop Benefit Ratings include Poor, Fair, Average, Very good and Excellent.

Table 1. Relative benefits of Austrian winter pea as a winter cover crop (Adapted from Midwest Cover Crops Field Guide, 2014).

One downfall of an AWP cover crop monoculture is the length of time that the residue remains on the soil's surface to provide erosion control and weed suppression. The low C:N ratio of the AWP residue tends to lead to very rapid decomposition of the residue (much faster than winter cereals), but will typically remain until summer cash crop canopy closure. For areas where erosion is a concern, or when AWP is planted in a blend with a winter cereal, leaving the residue on the soil surface can help prevent soil loss, but you can expect less than 50% recovery of the N credits gained by the AWP. In severe cases of soil crusting the use of a rotary hoe can aid in emergence of AWP, but needs to be set at a shallow depth to be effective.

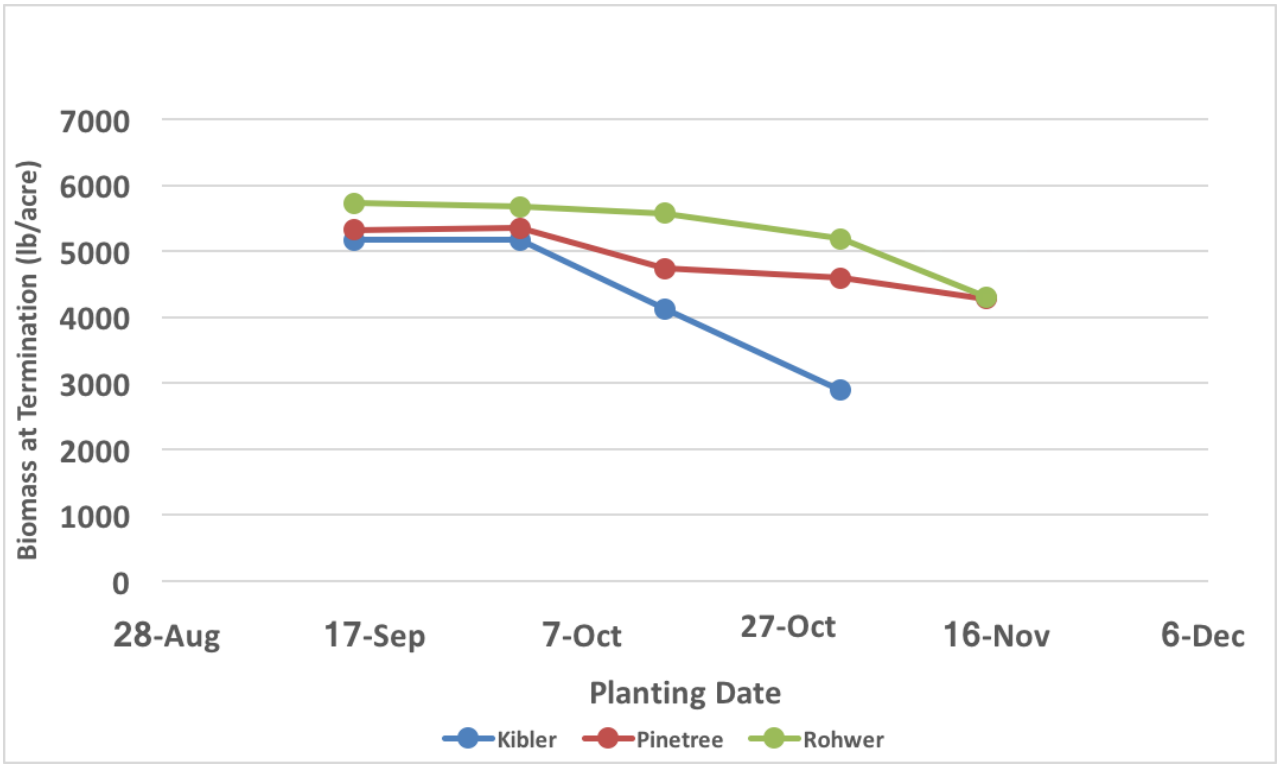


Figure 1. Austrian winter pea biomass as influenced by planting date at cover crop termination on April 1st of the following spring.

Planting Dates

Austrian winter pea is highly versatile and can be effectively established early in the fall following corn harvest (September) and very late in the fall following soybean harvest (November). Minimum soil temperature for AWP germination is 41° F, so they can be planted late in the fall and still germinate and establish effectively. They are not as cold tolerant as cereal rye in regards to establishment, but the planting dates are similar due to the fact that we do not tend to see extremely low soil temperatures until early December.

Similar to cereal rye, fall and winter growth of AWP can be significant and can provide adequate ground cover and N credits. However, late planted AWP may go dormant and not grow as well and have more winter-kill in unusually cold winters. Ideal planting dates for AWP in Arkansas are as follows (Figure 1):

Northern Arkansas (north of Hwy. 64) optimum planting window is Aug. 15 - Nov. 1.

Central Arkansas (south of Hwy 64 to north of Pine Bluff) optimum planting window is Aug. 15 - Nov. 15.

South Arkansas (south of Pine Bluff) optimum planting window is Aug. 15 - Nov. 15.

The planting window for AWP in Arkansas is quite large, making it a great cover crop choice for a variety of production situations and crop rotations. Although AWP is not as prone to damage from residual herbicide activity as tillage radish (Raphanus sativus) or small-seeded winter legumes such as clover, this is something that should be considered with all cover crops.

Herbicide activity is a function of soil texture, moisture and microbial activity. If you are concerned about residual herbicide activity influencing your AWP establishment you can easily gather soil from the fields of interest (both on beds and in-furrow) and do a simple germination test with your AWP seed to determine if there is a potential problem. Austrian winter pea exhibits hypogeal emergence meaning that the cotyledons remain below the soil surface and the first true leaves are the ones responsible for pushing through the soil surface. Due to this germination process, crusting can severely limit establishment of AWP.

Seeding Rates

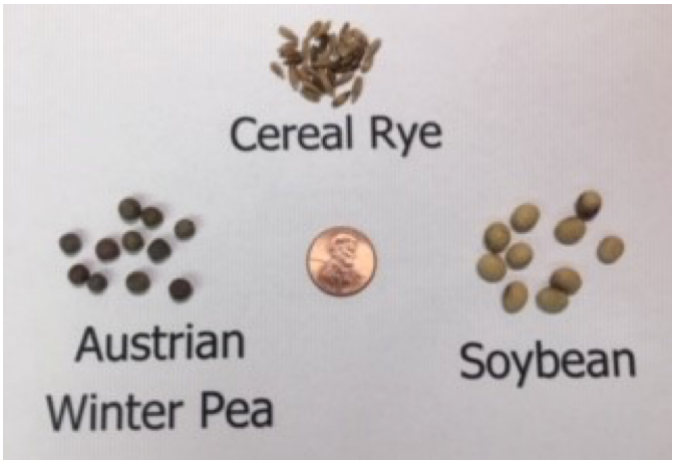
Precision Planter: 30 lbs. seed/acre

Drilled on 7.5-9" row spacing: 35-45 lbs. seed/acre

Broadcast or aerial seeding: 55-65 lbs. seed/acre

Planting depth: 1" -1 ½"

Austrian winter pea seed may be grayish, green, purplish or red in color, depending on variety and source, and will be similar in size to most soybean seed (Picture 1). Austrian winter pea is a legume that can fix substantial amounts of N, but must be inoculated with the correct type of inoculant in order to be effective. Soybean inoculant will not work on AWP seed. Most seed dealers carry the pea/vetch inoculant required for AWP or the seed will often times already come treated with the required inoculant product.



Picture 1. Comparison of Austrian winter pea seed size and color to soybean and cereal rye.

Site	Year	Month											
		Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Rohwer (Gallion sl)	2009	40.8	43.2	49.5	56.1	64.7	73.8	75.8	75.8	71.8	56.6	49.4	42.0
	2010	37.8	37.5	42.5	61.7	72.2	83.6	82.3	md†	md	md	52.1	42.0
Marianna (Calloway sl)	2009	42.0	46.6	53.1	51.7	72.0	83.5	83.6	84.9	79.5	63.3	57.1	43.9
	2010	40.8	40.1	51.5	66.2	76.1	87.7	88.8	90.8	82.2	70.4	56.1	42.9
Keiser (Sharkey cl)	2009	38.3	44.1	50.1	58.4	69.7	78.3	81.6	81.0	75.9	60.6	53.8	41.3
	2010	38.3	36.2	49.1	63.2	72.5	85.5	87.7	90.7	80.1	67.5	52.5	40.1

†*Missing Data*

Table 2. Average monthly soil temperatures (4-inch depth of bare soil) during 2009 and 2010 for three sites in eastern Arkansas.

Make sure your AWP is inoculated prior to planting seed. The most efficient establishment technique is using drills or planters similar to the establishment of a soybean crop, but it can be accomplished with aerial or broadcast seeding and shallow incorporation with something similar to a Kelly Diamond Harrow.

Picture 2. Austrian winter pea planted on 7.5" rows eight weeks after planting.

Fertilization

In most of the soils in eastern Arkansas, AWP will not require fertilization in order for producers to get the full benefits of the cover crop. There is no need to fertilize AWP with P or K for optimal results on the majority of our soils. However, AWP is responsive to K on soils where soil test K levels are low, but the majority of the K that is taken up by the AWP will leach out of the terminated residue and back into the cash crop root zone shortly following termination.

Land that has been recently leveled will often times benefit from the application of 1-2 tons of poultry litter per acre. Unlike cereal rye, applying the litter prior to AWP planting will not tie-up these nutrients in the AWP biomass and lower the availability to the following cash crop. Research is ongoing to determine how P and K fertilization needs to be addressed in these high residue cover crops, but to be safe, apply P and K fertilizers after AWP termination and prior to cash crop establishment. The low C:N ratio of AWP allows rapid decay and release of accumulated nutrients and tends to make them highly available to the following cash crop.

Burn Down/Killing Austrian Winter Pea

In the spring, AWP will break winter dormancy and begin rapid vegetative growth in mid to late February, depending on your location within the state (closer to early February for the southern portion of the state). Allowing the AWP cover crop to grow until mid-March or the beginning of April will provide sufficient biomass to realize many of the cover crop benefits and still allow adequate time for burndown and desiccation prior to cash crop planting. An AWP

Picture 3. Austrian winter pea residue on 30" beds three weeks following burndown herbicide application.

cover crop that will not be incorporated should be terminated a minimum of 28 days prior to the establishment of the following cash crop to ensure that there is no "green bridge" to harbor pests such as stink bugs and armyworms. The longer AWP is allowed to grow, up until first bloom, the more N credits you will gain. However, allowing AWP to grow increases the rate and incidence of lodging, which reduces the efficacy of burndown herbicide applications by decreasing the coverage and effectiveness of the herbicide.

Austrian winter pea can be difficult to terminate, but can generally be accomplished with Clarity at 16 fl oz/A or Gramoxone at 48 fl oz/A plus a PSII-inhibitor herbicide such as Aatrex or Cotoran applied prior to the first bloom stage. Chemical termination options range from $6-18/acre plus associated application costs. Earlier termination of AWP cover crop (prior to the first bloom stage) typically leads to better results. Austrian winter pea that will be incorporated should still receive a burndown application to help "melt" residue and make it easier to incorporate.

When AWP is planted in a cover crop blend, other herbicides may need to be added to control additional cover crop species in the blend, but the addition of glyphosate will typically aid in the termination of any winter cereal cover crop species. Remember that AWP can be a large biomass producer, and earlier termination can help alleviate the large amounts of biomass at planting, whether you are incorporating it or leaving the residue on the soil surface prior to establishment of the cash crop.

Insect Pest and Disease Considerations

Austrian winter pea can harbor many insect pests which can damage the following commodity crop, and is highly attractive to the pea leaf weevil, which is a common issue associated with this cover crop. Other insects commonly observed in AWP are stink bugs, three-cornered alfalfa hopper and cutworms. Pictures 4-8 show the negative effects insects can have on commodity crops when planted into green AWP.

Picture 4. Soybean stand reduction from three-cornered alfalfa hopper associated with AWP cover crop.

To prevent insect pests associated with AWP from impacting the following commodity crop, growers must eliminate the "green bridge." This is the period when both the cover and commodity crop are a viable food source for pests within a field, allowing them to easily transfer to the commodity crop once the cover is terminated. Austrian winter pea can harbor large numbers of insect pests and damage can occur rapidly if precautions are not taken. Burning down the cover crop 3-4 weeks prior to planting the commodity crop will either starve the insects or encourage them to leave the field to find another food source.

Foliar insecticides are a control option, but frequently, cover crops will produce a thick "mat" that impedes insecticide penetration, resulting in poor control of insect pests. In serious cases, multiple insecticide applications still may not provide adequate control of pests and can result in total crop loss. For this reason, early burndown is the best management practice for insect pest management in cover crops.

Insecticide seed treatments are an effective option for many, but not all insect pests, and are recommended when planting into cover crops. It is always wise to scout cover crops prior to planting and take appropriate action to avoid damage.

Picture 5. Pea leaf weevils, cucumber beetles, and three-cornered alfalfa hoppers associated with AWP cover crop. Feeding on leaf margins is characteristic of pea leaf weevil.

Winter legume cover crops, such as AWP, are susceptible to various leaf and soilborne diseases that could affect the cash crops that follow. Austrian winter pea is susceptible to Sclerotinia stem rot and Fusarium root rot. Peanut is susceptible to Sclerotinia sclerotiorum, while soybean and cotton are susceptible to the complex of Fusarium diseases. Environmental factors such as rainfall, temperature, and humidity influence disease incidence and severity, but cover crop susceptibility to specific diseases should be considered, if planting AWP as a single species or in a blend prior to legume cash crops.

Austrian winter pea is a poor host for soybean cyst nematode, but a good host to the southern root-knot nematode. The southern root-knot nematode is the most common species of root-knot nematode in row crops in Arkansas. In a recent greenhouse screening, AWP and barley (Hordeum vulgare) were more suitable (susceptible) hosts to the southern root-knot nematode compared to cereal rye. Although winter conditions often limit nematode reproduction, if AWP is allowed to grow late into the spring there is an increased possibility that AWP could sustain or increase populations of southern root-knot nematode for the subsequent cash crop.

For commodity crops planted following winter cover crops it is essential that both insecticide and fungicide seed treatments are used. Due to the dynamic nature of planting into cover crops, the likelihood of above-average, potentially harmful insect and disease pressure is increased. Therefore, it is highly recommended that producers use the labeled rate of commercially available seed treatments for the specific commodity crop.



Pictures 6,7,8. Impacts of stink bug feeding on corn planted into a cover crop blend containing AWP. From left to right: Malformed brace roots, "cowhorned" ears, plant stunting.

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