



Georgia Plant Materials Program Athens, GA

'TROPIC SUN' SUNN HEMP



COVER CROPS FOR THE SOUTHEAST

'AU SUNRISE' CRIMSON CLOVER



'FLORIGRAZE' PERENNIAL PEANUT

PLANT MATERIALS TECHNOLOGY

PLANT MATERIALS TEAM

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PREFACE

The objective of preparing 'Cover Crops for the Southeast' is to provide information on cover crops and the related technology that was developed by the USDA-Natural Resources Conservation Service Plant Materials Centers located in the Southeast Region. In many situations the centers do not get the recognition deserved and plants developed by plant materials centers lose their identity. In addition, this technical document is intended to be a technical reference for NRCS field offices and other users that are interested in cover crop technology, and will be referenced as a part of the field office technical guide (FOTG).

Cover Crops can be used for the conservation uses listed below:

- conservation tillage
- erosion control
- forage/grazing lands
- wildlife
- organic gardening
- conservation buffers
- green manure
- to improve soil health
- water quality improvement
- highway beautification and erosion control
- ground cover in citrus groves
- increase soil organic matter
- conserves soil moisture
- provides food and shelter for livestock

The publication is intended to bring attention to plant releases that are adapted to other regions, but have been found to be adapted for special uses, such as, 'Tropic Sun' Sunn Hemp. 'Tropic Sun' a tropical legume, was released by the Hoolehua Plant Materials Center in Hawaii. Its rapid growth allows this plant to add 147 pounds of actual nitrogen and as much as 3 tons/acre of organic matter in 60 days.

This document does not include cover crops developed by other sources. This information is usually readily available in other references. I want to personally thank Sam Sanders, Clarence Maura, Joel Douglas, Robert Joy and Glenn Sakamoto for providing slides and technical information, edits, and support for this document. This document is accessible on the Jimmy Carter Plant Materials Center Homepage at <http://www.ga.nrcs.usda.gov/ga/pmc> or National homepage at <http://Plant-Materials.nrcs.usda.gov>. I hope this information will meet the needs for NRCS field offices in the Southeast.

Donald Surrency

Plant Materials Specialist –Team Leader

INTRODUCTION

The USDA-Natural Resources Conservation Service (NRCS) Plant Materials Centers in the Southeast and Hawaii have released important cover crops for green manure, conservation tillage, organic farming, soil enrichment, and erosion control. The cover crops released by NRCS Plant Materials Centers are described in this technical reference.

Farmers have used legumes in crop rotations for many decades to improve soil fertility in the southeastern United States. Availability of relatively inexpensive chemical fertilizers contributed to a decline in their use as a nitrogen (N) source. More recently, producers have recognized legumes as valuable crops in water and soil conservation programs. Hence, there has been a renewed interest in these plants because of the benefits observed in systems that use conservation tillage for grain production.

Investigators at the Natural Resources Conservation Service (NRCS) Plant Materials Center at Americus, Georgia have assembled and evaluated collections of cool-season annual legumes for use as cover crops. They used the initial evaluation block located on Orangeburg sandy loam (fine, loamy, siliceous, theramic Typic Paleudults) to screen about 1,000 cool-season annual legume accessions. These legumes have included germplasm from several genera, including *Lathyrus*, *Trifolium*, *Vicia* and *Medicago*. They were assembled from foreign, as well as naturalized populations. All foreign accessions came through the Plant Introduction system.

The naturalized legumes were collected and processed by NRCS personnel in the southeastern United States. Each accession was evaluated for vigor, winter hardiness, stand, reseeding ability, flowering date, seed production, disease resistance, and insect resistance. These evaluations produced several selections for further testing.

Legumes have long been used as cover crops, and during the last decade numerous researchers have investigated their utility in conservation tillage. Hargrove and Frye (5) suggested important roles for legumes in modern systems: soil, water, and energy conservation; soil improvements; and enhanced productivity.

The Brooksville, Florida and Hoolehua, Hawaii Plant Materials Centers have developed warm season grass and legume cover crops for grazing lands, erosion control, biomass, organic matter improvement, cover for orchards and citrus groves and highway beautification. They include 'Florigraze' perennial peanut, 'Tropic Sun' Sunn Hemp and 'Tropic Lalo' Paspalum.

JIMMY CARTER PLANT MATERIALS CENTER AMERICUS, GEORGIA

The Jimmy Carter Plant Materials Center was established in 1936 to produce planting materials, mainly pine seedlings, for use by the CCC Camps and the former SCS demonstration projects. The center contains seven soil types, with Orangeburg predominating on its 327 acres. Approximately two-thirds of the land is open for cultivation. Muckalee Creek runs through the southwest corner, furnishing water for irrigation. The Center was operated on contract by the University of Georgia Experiment Station's from 1954 to 1975. The Natural Resources Conservation Service has operated the Center since 1976.

The Jimmy Carter Plant Materials Center is addressing the following resource issues:

- utilize native plants for grazing lands and sustainable agriculture initiatives
- utilize native plants for riparian areas, filter strips, and constructed wetlands to improve surface and ground water quality
- develop plants and technology for conservation tillage operations to reduce surface erosion

The Jimmy Carter Plant Materials Center serves NRCS field offices, public agencies, commercial seed and plant producers, and the general public in Georgia, Alabama, South Carolina, and parts of Florida and Tennessee.

These states present a wide range of climatic and soil conditions and include a total of 14 major land resource areas (MLRAs) representing over 120 million acres across the southeastern United States. Elevations in the service area range from sea level to 6,000 feet above sea level. Temperatures range from a low of -20 degrees in the mountains to a high of 110 degrees along the coast. The frost-free growing season varies from 130 days in the mountains to more than 230 days along the coast. Annual rainfall over the area ranges from 45 inches to 80 inches.

In 1983-84, an assembly of cool season annual legumes was conducted at the Jimmy Carter Plant Materials Center (GA) for initial cover crop studies for conservation tillage. Approximately 1,000 cool-season annual legume accessions were evaluated for use as cover crops. These legumes have included germplasm from several genera, including (*Lathyrus*, *Trifolium*, *Vicia*, and *Medicago*.)

In 1983, the NRCS Jimmy Carter Plant Materials Center began to develop cool season legume plants for cover crop and conservation tillage use. These plants not only provide excellent winter cover protection; they also contribute valuable nitrogen to the soil.

COVER CROPS RELEASED BY PLANT MATERIALS CENTERS

'Americus' Hairy Vetch

In 1993 a late maturing hairy vetch called 'Americus' hairy vetch was released by Jimmy Carter PMC and the University of Georgia. 'Americus' hairy vetch produces an abundance of dry matter for soil enrichment and protection.

'AU Ground Cover' Caley Pea

During the same year the Jimmy Carter PMC and Auburn University released another legume cover crop called 'AU Ground Cover' Caley pea. This plant is especially adapted to heavy calcareous clays.

'AU Early Cover' Hairy Vetch

In 1994 an early maturing hairy vetch called 'AU Early Cover' Hairy vetch was released by the PMC and Auburn University. Early developing cover crops such as this add flexibility to conservation cropping systems. The earliness of maturity of 'AU Early Cover' vetch makes it a good choice as a legume cover crop for conservation-tillage systems using cotton.

'AU Sunrise' Crimson Clover

An early blooming crimson clover was released by Jimmy Carter PMC and Auburn University in 1997. This latest release is called 'AU Sunrise' Crimson clover. 'AU Sunrise' blooms earlier than any other crimson clover on the market. Results from two years of testing have shown 'AU Sunrise' is a cultivar that flowers 5 to 18 days earlier than 'AU Robin' and 12 to 28 days earlier than 'Dixie' and 12 to 28 days earlier than 'Tibbee' crimson clover. It should fit into several green manure and conservation tillage systems.

It should be adapted in suitable sites in the Southeast where 'Tibbee', 'Dixie', and 'AU Robin' crimson clover are grown. Seed should be commercially available for Fall plantings in 2000.

'AMCLO' Arrowleaf

'Amclo' arrowleaf clover (*Trifolium vesiculosum*) was released in 1963 jointly by the USDA-NRCS Jimmy Carter Plant Materials Center and Georgia Agricultural Experiment Station. It is a cool-season annual legume. 'Amclo' arrowleaf clover appears now to be best adapted to the Piedmont and Coastal Plains resource areas in Georgia, South Carolina, west Florida and southeast Alabama.

DEVELOPMENT OF COOL-SEASON LEGUME

'Americus' hairy vetch



'Americus' hairy vetch Bloom

Jointly released with the University of Georgia, this plant provides excellent winter cover, produces organic matter and nitrogen for summer crops, and is recommended for use in conservation tillage.



'Americus' hairy vetch seed Production Field

'AU Early Cover' hairy vetch



'AU Early Cover' Bloom *Vicia villosa*

In 1994 an early maturing hairy vetch called 'AU Early Cover' hairy vetch was released by Jimmy Carter Plant Materials Center and Auburn University for conservation tillage.



'AU Early Cover' Bloom *Vicia villosa* Production

Early developing cover crops, such as 'AU Early Cover' add flexibility to conservation cropping systems. It makes excellent winter cover, organic matter, and nitrogen for early spring planted crops.

'AU Ground Cover' Caley Pea



During the same year the Jimmy Carter PMC and Auburn University released another legume cover crop called 'AU Ground Cover' Caley Pea. It is adapted to heavy calcareous clays. It is recommended for use in conservation tillage and is mainly used in the Black Belt areas of Alabama and Mississippi as a forage and winter cover crop.

'AU Ground Cover' Bloom



'AU Ground Cover' Caley Pea *Lathyrus hirsutus*



'AU Ground Cover' Evaluation Plots



'AU Groundcover' Production Field

'AU Sunrise' Crimson Clover



'AU Sunrise' Bloom

An early blooming crimson clover was released by Jimmy Carter PMC and Auburn University in 1997. The latest cover crop release is called 'AU Sunrise' crimson clover. This new crimson clover blooms earlier than any other crimson clover on the market.



'AU Sunrise' Evaluation



'AU Sunrise' Seed Production Field



'AMCLO' ARROWLEAF CLOVER

BROOKSVILLE PLANT MATERIALS CENTER BROOKSVILLE, FLORIDA

The Florida Plant Materials Center (FLPMC) is located approximately 6-7 miles north of the City of Brooksville on US Highway 41, 50 miles north of Tampa, and 15 miles inland from the Gulf of Mexico. The center is situated on 182 acres of property owned by the federal government.

There are 43 acres under cultivation, used for evaluation and production of plant materials. Most of the fields, both greenhouses and the shadehouse are watered by an automatic irrigation system, giving flexibility for the amount of water fields receive as well as allowing the FLPMC to comply with local water use restrictions. The remaining 139 acres are native woodlands and planted pines. The woodland is a mixture of planted and native pine with areas of hardwoods. The planted pine area is under a prescribed burn management program to stimulate tree production and develop a varying wildlife habitat. Two nature trails wind through the wooded area, and have selected trees and shrubs identified. These trails are frequently visited by many individuals, groups and organizations, both for self-interest and for educational purposes. In these areas two rare and endangered plants species, Cooley's water willow (*Justicia cooleyi*) and Sinkhole fern (*Blechnum occidentale*) have been located, and are being monitored for protection. Wildlife, such as deer and wild turkey, are abundant in the wooded areas.

Soil at the FLPMC is predominately Kendrick Loamy Fine Sand. Other types of soil at the Center consist of Arredondo Fine Sand, Blichton Loamy Fine Sand, Electra Variant Fine Sand, Fleminton Fine Sandy Loam, Floridana Variant Loamy Fine Sand, Kanapaha Fine Sand, Nobleton Find Sand, Sparr Find Sand, and Wauchula Fine Sand.

The Brooksville Plant Material Center has developed two cover crops for conservation.

'Florizgraze' Perennial Peanut (Arachis glabrata)

'Florizgraze' perennial peanut can be used for the following conservation uses:

- (1) legume and legume-grass pastures
- (2) forage, hay or silage
- (3) cover crops for erosion control in row crops and groves
- (4) stabilization of roadsides and engineering structures
- (5) beautification in homes, parks and highways

Armex lupine (Lupinus elegans)

Armex lupine is a cool season annual legume adapted to use as a cover crop and as a green manure crop on sandy, moderately well to well drained soils of Central and Southern Florida. It produces good ground cover in citrus groves for erosion control.

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'FLORIGRAZE' PERENNIAL PEANUT (*Arachis glabrata*)



'Florigraze' perennial peanut is carefully evaluated for forage quality by the Brooksville Florida Plant Materials Center staff.



'Florigraze' is used in Florida for erosion and sediment control and beautification along the highway medians.

ARMEX LUPINE (*Lupinus elegans*)



Armex lupine is used as a green manure cover crop and a groundcover in citrus groves.

SPECIES

(*Lupinus elegans*) – Armex Mexican lupine

ACCESSION NUMBER

F-11 – PI-185099

ORIGIN

The accession was introduced from Mexico via the National Plant Introduction Station and SCS Brooksville, Florida, Nursery. It was first planted at the Arcadia Plant Materials Center in October 1957.

METHOD OF BREEDING OR DEVELOPMENT

Seed increases were made of the original material.

DESCRIPTION

Armex lupine (*Lupinus elegans*) is a cool season, annual legume which develops from a solitary stem into several lateral and upward reaching branches to 4 feet or more in height and to 3-3 ½ feet of spread. The stems are moderate in number, of medium thickness, soft, and sub-erect to erect. Leaves are deep green, severely lobed,

Cover Crops for the Southeast

moderately pubescent, abundant, soft and well distributed. It is a strong plant which develops upon a strong, deep probing, well branched taproot. The showy white fringed purple flowers are arranged on terminal racemes 8-12 inches long. Abundant flowering and subsequent seed maturity and shatter proceed acropetally for a period of 7-10 days for each phase of development. Seed production is abundant, but uniformity of ripening is poor. At Arcadia, this lupine commences blooming about January 15 reaching maximum bloom toward the end of February and continues usually past April.

Volunteer seedlings generally germinate about November 1-15 with slow development during the early weeks. Following a heavy seed production period of 1-2 months, the plants rapidly becomes senescent and die, usually by April 15 to May 1. Diseases have not been noted.

ADAPTATION AND USE

This plant is adapted to use as a cover crop and as a green manure crop on the sandy, moderately well to well drained soils of central and southern Florida. Neither the northern climatic limits nor its adaptability to heavier soils has been determined.

A large per acre tonnage of fresh materials is produced annually. Palatability to cattle is unknown, but the small plants are eaten by rabbits. The seeds have a high alkaloid content and have the good quality of hard seededness.

STATUS OF SEED SUPPLY

A seed block is being maintained at the Plant Materials Center at Brooksville, Florida, for further testing. The plant has not been released nor certified.

HOOLEHUA PLANT MATERIALS CENTER HOOLEHUA, HAWAII

The Hoolehua Plant Materials Center is located on Molokai in the Hawaiian Islands. The center was established in 1957 on Maui and it was later moved to Molokai in 1972. The area served by the Hoolehau PMC include the Hawaiian Islands, Guam, Islands of the Commonwealth of the Northern Marianas, the Republic of Belau, Federated States of Micronesia, Marshall Islands and American Samoa, all of which owe their shape primarily to volcanic building. The islands all have been modified by erosion under strongly localized conditions. Elevations vary from sea level to more than 10,000 feet above sea level.

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Soils are derived from volcanic lava, eruptive deposits of ash, tuff and cinders, and limestone and alluvial deposits from coral reefs. Age and a variety of parent material, plus extreme ranges in rainfall, have resulted in a complexity of soil types. Rainfall in the service area ranges from less than 10 inches to more than 390 inches annually. The driest areas are semi-desert. Land use is diversified. Large acreages are devoted to ranching, sugarcane, macadamia nuts, coffee, and pineapple. Smaller acreages are used for truck crops, orchards, and subsistence farming.

'TROPIC SUN' SUNN HEMP



'Tropic Sun' Sunn hemp Bloom



'Tropic Sun' Sunn Seed
Production Field 5 feet
tall at 80 days old



Tropic Sun' Sunn Production Field

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'Tropic Sun' Sunn Hemp Hoolehua Plant Materials Center, Hoolehua, Hawaii



'Tropic Sun' Sunn Hemp seed production field.



'Tropic Sun' seed production field in full bloom.



Harvesting Sunn Hemp Seed in Hawaii.

'TROPIC LALO' PASPALUM

Paspalum hieronymii

'Tropic Lalo' (*Paspalum hieronymii* Hack) is recommended for use as ground cover in orchards in Southern Florida. In Hawaii it is used for waterways, roadsides and other erosion prone areas. 'Tropic Lalo' will not overwinter at Americus, Georgia (PMC) and Coffeeville, Mississippi (PMC). Therefore its adaptation is limited to Southern Florida.

JAMIE L. WHITTEN PLANT MATERIALS CENTER COFFEEVILLE, MISSISSIPPI

The Jamie L. Whitten Plant Materials Center, located in Coffeeville, Mississippi, began operations on August 8, 1960 functioning both as a PMC and a seed production unit for the Yazoo-Little Tallahatchie Flood Prevention Project. The seed production unit was discontinued in 1982, and the plant materials function was reorganized and expanded. During its tenure, the PMC has evaluated over 6,800 plant accessions for erosion control on cropland, stream channels, and critical areas, as well as for forage production, wildlife food and cover, and wetland mitigation and restoration.

The areas served by the Jamie L. Whitten PMC are usually rolling except for nearly level floodplains and narrow cliffs along streams and rivers. The climate is temperate and humid. Average rainfall is about 50 inches, and the temperature increases greatly from north to south. Frost-free days range from about 200 in the north to 340 in the extreme south.

TECHNOLOGY DEVELOPED FOR COVER CROPS

Technical Reports

Technology transfer is a major priority at the Jamie L. Whitten PMC. Since 1985, numerous reports have been prepared on plant materials studies conducted by the PMC. Technical reports available for distribution are listed below.

1996 Reports

- Reseeding Arrowleaf Clover as a Nitrogen Source for No-till Cotton
– Herby Bloodworth
- No till Grain Sorghum Response to Arrowleaf Clover and Nitrogen
– Herby Bloodworth
- Cover crops and C-factors for Conservation Tilled Sweet potato
– Herby Bloodworth, Larry Golden, and Ken Ainsworth.
- Cover Crop C-values for No-till Peanut
– Herby Bloodworth, Larry Golden, and Ken Ainsworth.
- Cover Crop C-factors for Cotton Tillage Systems
– Herby Bloodworth

1995 Reports

- Comparison of Americus and Commercial Source of Hairy Vetch as a Cover Crop
– Joel L. Douglas
- Using Hairy Vetch as a Nitrogen Source for Cotton – Herby Bloodworth
- Reduced Cover Crop Seeding Rates for No-till Cotton – Herby Bloodworth
- Renovation of Conservation Reserve Program Fields

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- Herby Bloodworth and Mike Lane

Establishment of Methods of Sweet Potato in a Conservation Tillage System

- Herby Bloodworth and Mike Lane

Sweet potato and Peanut Response to Cover Crops and Conservation Tillage

- Herby Bloodworth, Mike Lane, and Joe Johnson

1994 Reports

Peanut response to cover crops and tillage - Herby Bloodworth and Mike Lane

Sweet potato response to cover crops and conservation tillage

- Herby Bloodworth and Mike Lane

Cover crops potential of white clover: Morphological characteristics and persistence of thirty-six varieties - Joe Snider, Herby Bloodworth, and Vance Watson

Establishment methods of cover crops in no-till cotton

- Herby Bloodworth, James A. Wolfe, and Joe Johnson

1993 Reports

Peanut Response to Cover Crops and Tillage - Herby Bloodworth

Sweet potato Response to Tillage and Cover Crop - Herby Bloodworth

Evaluation of White Clover Varieties for Use in No-Tillage Systems and the Conservation Reserve Program - Joe Snider and Herby Bloodworth

Cover Crops Response to Soil Applied Herbicides Used in Cotton

- Herby Bloodworth and Joseph R. Johnson

1990 Reports

No-Till Cotton Trials: I. Establishment Methods of Cover Crops in No-Till Cotton

- L.H. Bloodworth

No-Till Cotton Trials: II. Effects of Cotton Herbicides on Cover Crops - L.H. Bloodworth

No-Till Cotton Trials: III. Effects of Cover Crops on Tillage and Cotton - L.H. Bloodworth

1988 Reports

Evaluation of Potential Cover Crop Species for use in Chemically Treated Cotton Fields

-J.A. Snider, J.A. Wolfe, and B.B. Billingsley

WARM SEASON LEGUMES



'TROPIC SUN' SUNN HEMP

PERENNIAL PEANUT

Arachis glabrata

DESCRIPTION

Perennial peanuts are summer growing leguminous herbs which will grow as far north as Tifton, Georgia. They will grow with grasses and supply nitrogen to the soil. These peanuts grow to 2 1/2 feet in length but will ordinarily stand only 15-17 inches tall. They spread by underground stems (rhizomes). The above ground stems are single, erect, and arise from nodes on the underground stems. The foliage is similar to that of commercial peanuts, but becomes thicker and somewhat more leathery as the plants age. When frosted the foliage will die. These peanuts are propagated by use of rhizomes instead of seed. Underground peanuts are small and are produced only sparingly. Flowers are yellow to orange and do not produce seed.

USES

Perennial peanuts can be used for legume and legume-grass pastures; forage, hay or silage; cover crops for erosion control in row crops and groves; stabilization of roadsides and engineering structures; and beautification in homes, parks and highways.

CULTIVARS

'Florigraze' peanut: 'Florigraze' rhizomes are generally about 1/8 inch in diameter, but have been observed to be 3/16 inch or larger in diameter.

Tap roots are produced from the base of rhizomes but none have been observed from continuing lateral rhizome development. Good top growth begins 1-2 weeks after the start of the summer rainy season and continues into the late summer and autumn months. Plant material is available commercially.

'Arbrook' peanut: 'Arbrook' rhizomes are 3/16-5/16 inch in diameter and are sometimes noted at 1/2 inch or more thickness. New rhizomes develop central taproots. Additional taproots are produced in moderate number by the lateral rhizomes. These are produced singly and have been noted to continue growth through the April and May drought periods. Continued growth is excellent through the summer and early autumn months.

AREA OF ADAPTATION

These plants are adapted to use on moderately well drained to well drained soils. Arbrook is better adapted to excessively drained soils than 'Florigraze'. Both varieties will do well throughout Florida; southern Georgia; and the coastal areas of Alabama, Louisiana, Mississippi and Texas and throughout Puerto Rico.

RATE OF PLANTING

Twenty to forty bushels of 'Florigraze' vegetative materials (rhizomes) per acre, sixty to eighty bushels of 'Arbrook' per acre.

SOIL PREPARATION

The field should be thoroughly tilled and treated with preplant, preemergence herbicides. The herbicides are similar to those used for annual peanuts.

Contact the County Agricultural Agent for herbicide recommendations.

DATE OF PLANTING

The best time to plant is the dormant season. Vegetative plant materials for plantings of cultivars are available from commercial vendors and the Brooksville PMC. Vegetative materials for plantings from the Brooksville PMC will be made available in spring, up to 7 days before the average date of the last spring frost at the destination or the planting site.

METHOD OF PLANTING

Rhizome materials freshly dug with a rhizome or sprig harvester are used for planting. Top growth materials are mowed and removed. Rhizomes are dug and planted in one of three ways:

- Sprigger – set depth at 3-4 inches and row width at 0.5 meters (20 inches) or 1.0 meter (40 inches), cultipack after planting.
- Disc – spread rhizomes uniformly over a loose surface and incorporate with a disc to a depth of 3-4 inches, cultipack after planting.
- Furrow – plow open a furrow 3-4 inches deep, place rhizomes end to end, close furrow, cultipack after planting.

Good soil moisture conditions are required at planting time and during the establishment period.

FERTILIZER

Apply fertilizer according to soil test recommendations. However, fertilizer should not be applied for 3-4 weeks after planting.

MANAGEMENT

Established perennial peanuts can withstand mowing and grazing and are readily managed in pastures. Perennial peanut should not be grazed the first year, unless it has become well established in association with a forage grass that is ready for grazing. A weed control program of herbicides and mowing over the top of the peanut is essential for stand development. Contact the County Agricultural Agency for herbicide recommendations. Optimum forage quality and yields are realized with a 6 week grazing cycle 8 week height is necessary to make hay). Three cuttings totaling 6 tons per acre can be expected from a well managed stand over 2 years old.

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The peanut is well adapted to grow with Pangolagrass, 'Pensacola' bahiagrass or 'Coastal' bermudagrass.

'TROPIC SUN' SUNN HEMP

Crotalaria juncea

A POTENTIAL NEW COVER CROP

Cover crops play an integral role in residue management systems. Tillage management and Nitrogen (N) contribution to subsequent crops have been the focus for most research on winter legume cover crops.

One tropical legume that is adapted to residue management systems is the Southeast sun hemp (*Crotalaria juncea* L.). This legume is nontoxic and can be used as a cover crop. Although not winter hardy, sunn hemp may produce sufficient biomass during the fall (until freeze kills the plants) to provide ground cover and N to a following summer cash crop.

The sunn hemp cultivar 'Tropic Sun' was jointly released by the USDA-Natural Resources Conservation Service (NRCS), the University of Hawaii, the Hawaii Institute of Tropical Agricultural and Human Resources, and the Department of Agronomy and Soil Science (Rotar and Joy, 1983). Rotar and Joy (1983) described sunn hemp as an erect, branching, annual legume. It grows rapidly, achieving a height of over 1.2-m (4 ft.) in 60 days when grown under favorable conditions. It can attain a height of over 1.8-m (6 ft.) in approximately 90 days.

'TROPIC SUN' SUNN HEMP

Crotalaria juncea L.

INTRODUCTION

This sunn hemp cultivar is a cooperative release by the United States Department of Agriculture, Natural Resources Conservation Service; and the University of Hawaii, Hawaii Institute of Tropical Agriculture and Human Resources, Department of Agronomy and Soil Science.

ORIGIN

The seed of 'Tropic Sun' (*Crotalaria juncea* L.) was purchased in 1958 from a farmer who grew it as a cover crop on the island of Kauai. No other information is available regarding its origin. In the past, the Pineapple Research Institute did considerable work with the (*Crotalaria*) in the species nursery. It was further tested with three other promising (*Crotalaria*) species and various commercially available legumes and nonlegumes for use as a green manure crop. The Agricultural Research Service's Poisonous Plant Laboratory and the University of Hawaii tested the plant and its seeds for toxic substances, nematode resistance, and chemical content. Sunn hemp is

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generally considered native to India, where it is used extensively for soil improvement, bast fiber, and occasionally for forage. It is probably the most widely grown green manure crop in the tropics, and is found in Indonesia, Rhodesia, Malaysia, Taiwan, Thailand, and China.

DESCRIPTION

'Tropic Sun' is an erect, branching, annual legume. It is a rapid, vigorous grower, achieving a height of over 4 ft. (1.2 m) in 60 days when grown under favorable conditions. It can attain a height of over 6 ft. (1.8 m) in approximately 90 days.

The plants are generally unbranched from the ground to approximately 2 ft. (60 cm). Above this height, many branches will develop if plants are not crowded. Branching begins higher and to a lesser extent if plant population is high, as for a green manure crop. The simple elliptical leaves are 2 ½ to 5 inches (6 ¼ to 12 ½ cm) long and ½ to 1 inches (1 ¼ to 2 ½ cm) wide.

The flowers are bright yellow, and normally 18 to 20 of them will develop on terminal racemes. The papery, inflated seedpods are cylindrical, 1 to 1 ¼ inches (2 ½ to 3 cm) long and ¼ to ½ inches (1/2 to 1 ¼ cm) wide.

Seeds are dark slate green and about ¼ inches (1/2 cm) long. There are about 15,000 seeds per pound (30,000 to 35,000/kilograms). Seed germination is high. Seeds and forage of 'Tropic Sun' were nontoxic in laboratory tests and feeding trials. Other species of (*Crotalaria*) contain poisonous alkaloids and, under certain conditions, can be toxic to animals.

USE

'Tropic Sun' is principally used as a green manure crop for soil improvement. It is an excellent, rapid-growing green manure to be included in rotation with vegetable, ornamental, and other plants to add nitrogen and organic matter, to suppress weeds, and to reduce root-knot nematodes. To achieve maximum benefits, plantings should be made at regular intervals in a planned crop rotation scheme.

'Tropic Sun' has added 134 to 147 pounds of actual nitrogen per acre (150 to 165 kg/ha) to the soil when grown for 60 days and then incorporated in test plots. Organic matter yields as much as 3 tons/acre (7 t/ha) air-dry weight can be produced within 60 days if growing conditions are favorable. In addition, 'Tropic Sun' is resistant to root-knot nematodes. Experiments have shown that the number of root-knot nematodes in the soil can be reduced, probably because 'Tropic Sun' is not a suitable host.

ADAPTATION

'Tropic Sun' is adapted year round in Hawaii below an elevation of 1,000 ft (300 m) and in summer below 2,000 ft (600 m). It has been successfully used as a green manure cover crop in Alabama. Because of its rapid growth it can produce good cover, biomass and nitrogen (N) before it is winter killed. Below 1,000 ft (300 m) it will grow well the entire year, however, because it is a warm-season plant, its growth during the winter may be slower than in summer. It is not recommended for use above an elevation of 2,000 ft. (600 m).

'Tropic Sun' is adapted to soils ranging from coarse to fine textured, and on infertile as well as fertile soils. It grows best on well-drained soils with pH levels from 5 to 7.5. 'Tropic Sun' full range of adaptation is not yet known since most of the testing has been limited to Hawaii's conditions. In the continental United States it should be adapted to spring and summer planting in the South and Southwest Region.

ESTABLISHMENT AND MANAGEMENT

To establish a successful stand, 'Tropic Sun' seed should be broadcast and covered or drilled about ½ to 1 inch (1 ¼ to 2 ½ cm) deep in a well-prepared, weed-free seedbed. For maximum yields, a soil test should be taken and the fertilizer and other soil amendments applied as recommended. Calcium carbonate for pH adjustment to at least pH 6.0 and phosphorus are needed for maximum dry matter and nitrogen production. Soils low in these elements should be fertilized to meet the needs of the crop. For example, some soils low in phosphorus may require an application of 300 lb./acre (336 kg/ha) of treble superphosphate or 600 lb./acre (673 kg/ha) of single superphosphate fertilizer before planting. This phosphate can also be used by the succeeding cash crop.

If broadcast, 'Tropic Sun' should be seeded at the rate of 40 to 60 lb. pure live seed per acre (45 to 67 kg/ha). If drilled, the seeding rate should be 30 to 50 lb/acre (34 to 56 kg/ha) in 6-inch rows. The higher seeding rates should be used if the crop is to be incorporated in less than 60 days (30 to 45 days) or if severe weed competition is expected.

High plant populations also tend to enhance stem succulence for easier incorporation. The seed should be inoculated with cowpeas-type or "EL" inoculant to ensure effective nodulation, as some soils may not contain the correct *Rhizobium* strain.

Damping-off disease of seedlings may occur during periods of high rainfall when the soil remains moist, although this has not been a serious problem. Good seedling vigor of 'Tropic Sun' seedlings makes it easy to achieve a thick stand. Irrigation may

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be necessary to promote rapid germination and early growth. 'Tropic Sun' should receive a minimum of 1-inch (25 mm) of moisture per week for maximum growth; however, it is quite drought tolerant. In a trial planting on Molokai, it produced a modest yield of about 1,000 lb./acre (1120 kg/ha) of green matter after 6 weeks on a total of only 2 in (50 mm) of moisture.

Sunn hemp should never be allowed to grow beyond the full-bloom stage if it is being grown for green manure. The crop should be plowed down either in the bud or early flowering stage, which normally is about 60 days or less after planting. If allowed to grow beyond this stage, the plants will become fibrous and will be very difficult to plow under.

Home gardeners and farmers with light tillage equipment should plan to incorporate the plants when they are no taller than about 3 ft (90 cm), in 30 to 50 days. When turned under at or before early bloom stage, nitrogen content will be high and decomposition rapid. This is important when a large quantity of nitrogen is desired immediately for subsequent cash crops.

Timing of plow-down is especially important in high-rainfall areas where too much soil moisture may prevent plowing at certain times. It is better to plow the green manure crop under earlier than usual when soil moisture conditions are favorable, rather than risk having the crop become overmature.

Conversely, it may be necessary to irrigate before plowing in order to bring soil moisture to a favorable level in low-rainfall areas. Satisfactory methods have been developed to turn the crop under. They are (1) mow with a rotary or flail mower, then plow as soon as possible so the material does not get too dry; the chopped material plows under easily when green, whereas when dry it becomes light and tends to pile and drag in front of the plow; (2) plow the erect, standing crop; a single plow will usually do a better job than multiple plows; the crop should not be lightly disked or otherwise laid down before plowing, as the plants will become tangled in the plow; (3) rototill with rear-tine machines when the plants are succulent; if the crop is tall (over 4 ft), it should be mowed first; (4) disk with a heavy duty disk when the plants are succulent; soil moisture must be at the correct level for any of these tillage methods to work well.

'Tropic Sun' may be incorporated as early as 30 to 45 days after planting and still contribute nitrogen and organic matter, although at reduced levels. This may be important to growers who want to keep their land in cash-crop production for the maximum amount of time.

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The plants will be 18 to 36 in (45 to 90 cm) tall. At this stage of growth, plowing, disking, or rototilling are easily accomplished. Growers who prefer to incorporate the crop 30 to 45 days after planting should seed at the rate of 60 lb/acre (67 kg/ha).

SEED AVAILABILITY AND PRODUCTION

'Tropic Sun' seed was made available in 1983 under the Seed Distribution Program of the University of Hawaii, or commercial sources. Breeder and Foundation seed is maintained by the Natural Resources Conservation Service's Plant Materials Center on Molokai. Small quantities of Tropic Sun seed can be obtained for adaptation studies, field trials research and on farm demonstration in Alabama, South Carolina, Georgia and Florida. Requests for seed should be made through the plant materials specialists' that serves your area. Limited amounts of 'Tropic Sun' seed can be produced by allowing a small area of planting to mature and develop seed pods. The pods may be hand-harvested when the seeds rattle in the pods, normally about 5 months after planting. The pods are then crushed or cracked and the seeds separated. This procedure is labor intensive and is practical where only a small amount of seed is needed or where seed is not commercially available.

'TROPIC LALO' PASPALUM

Paspalum heironymii Hack

'Tropic Lalo' paspalum (*Paspalum hieronymii*) is used as a ground cover in orchards, waterways, roadsides and other erosion prone areas in Southern Florida. It was released in 1984 by the United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the University of Hawaii, Hawaii Institute of Tropical Agriculture and Human Resources, Department of Agronomy and Soil Science.

'TROPIC LALO' PASPALUM

Paspalum hieronymii

'Tropic Lalo' paspalum (*Paspalum hieronymii Hack*) is recommended for use as ground cover in orchards, waterways, roadsides and other erosion prone areas. It will trap large amounts of sediment if grown in waterways. This low-maintenance cultivar requires only infrequent mowing and has such dense growth that it crowds out weeds. When mowed weekly or biweekly, it becomes matlike and makes a coarse but very acceptable turf for lawns or pathways. Its tough, coarse stolons will tolerate moderately heavy use from vehicular equipment and foot traffic..

'Tropic lalo' was released in 1984 by the United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the University of Hawaii, Hawaii Institute of Tropical Agriculture and Human Resources, Department of Agronomy and Soil Science.

DESCRIPTION

'Tropic Lalo' is a low-growing, rapidly spreading stoloniferous grass that usually attains a height of about 12 inches; however, it may reach a height of 24 inches under moist, fertile conditions. Its many stolons readily root at the nodes to form a dense, sodlike turf. The abundant leaves are linear, approximately 3 to 9 inches long and ½ inch wide. Coarse hairs about 1/16 to 1/8 inch long cover the leaves and stems. The flowering stems are semierect and 12 to 24 inches high, depending upon soil fertility.

Seed production is sparse, about 1 to 2 percent of viable seed are produced.

ADAPTATION

'Tropic Lalo' is well adapted to subtropical areas that have an annual rainfall of 40 to 100 inches. Areas of adaptation include Guam, Puerto Rico, the Hawaiian Islands below an elevation of 3,000 feet, and the subtropical part of southern Florida. If irrigated, 'Tropic Lalo' will grow well in drier areas. Its adaptation to the continental United States is not well known, but it may be adapted to other coastal areas in the South and Southwest.

'Tropic Lalo' is adapted to a wide range of soil conditions from coarse to fine textures and from strongly acid to slightly alkaline reactions (pH 4.5 to 7.5). It is somewhat tolerant of infertile soils and of low-lying soils that tend to stay wet but not waterlogged. It does not tolerate long, dry periods, but is quite resistant to water erosion and tolerates 50 to 60 percent shade. Under shaded conditions, however, growth is slower and a less dense mat forms.

ESTABLISHMENT

'Tropic Lalo' is established from sprigs (stem cuttings) planted on grids that range from 12 by 12 inches up to 36 by 36 inches. Sprigs may be broadcast and lightly covered with a disk or planted in furrows that are 1 to 3 or more feet apart. The minimum planting rate should be no less than 40 bushels of sprigs or stolons per acre. Higher rates may be required in closer spacings.

In plantings of 12 by 12 inches, complete cover may be achieved in as little as 6 weeks. The areas to be planted must be moist or irrigated, as the sprigs and newly established plants are susceptible to drought.

Seedbed preparation may be minimal, using herbicides or disking, or both, to control weeds; however, a well prepared seedbed is preferred. Weeds, which may be a problem until the grass is established, may be controlled by frequent mowing.

MANAGEMENT

'Tropic Lalo' is excellent for use as ground cover. It will need only infrequent mowing unless a closely cut turf is required, such as for a lawn or ground cover in

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macadamia nut orchards. Mowing may be necessary 6 to 30 times a year, depending upon use and location. The cutting height may be less than 1 inch, as recovery is good.

This cultivar will respond to fertilizer nitrogen at rates of up to 200 lb/acre/year of area. Once established, however, fertilizer applications may not be necessary. In orchards, the fertilizer used for the trees should provide sufficient nutrients. 'Tropic Lalo' may be grown in association with, and obtain its nitrogen from, legumes such as white clover (*Trifolium repens*) big trefoil (*Lotus pedunculatus*) or the desmodiums (*Desmodium spp*). 'Tropic Lalo' has been compared to hilograss (*Paspalum conjugatum*), 'Pensacola' bahiagrass (*Paspalum notatum*), seashore paspalum (*Paspalum vaginatum*) and kikuyugrass (*Pennisetum clandestinum*).

It is slower growing and requires less maintenance than kikuyugrass. It is faster spreading than bahiagrass and does not grow as tall. It provides better cover than hilograss and is adapted to a wider range of environments than seashore paspalum, which is primarily used around brackish water.

'Tropic Lalo' can be damaged by the grass webworm (*Herpetogramma licarialis*) (Walker).

COOL SEASON LEGUMES



'AU SUNRISE' CRIMSON CLOVER
Trifolium incarnatum

INTRODUCTION

In 1994 the NRCS Jimmy Carter Plant Materials Center and the Auburn University, Alabama Experiment Stations released an early developing hairy vetch called 'AU EarlyCover'.

In 1997, the NRCS Jimmy Carter Plant Materials Center and the Auburn University, Alabama Experiment Stations released an early developing crimson clover called 'AU Sunrise'. Results from two years of testing have shown 'AU Sunrise' is a cultivar that flowers 5 to 18 days earlier than 'AU Robin' and 12 to 28 days earlier than 'Tibbee' crimson clover. This new crimson clover should fit into several green manure and conservation tillage systems.

AREAS OF ADAPTATION

The cultivar is well adapted to fertile upland soils of Alabama and Georgia. Further comparison testing will be done before the complete useful range of this cultivar is determined. However, it should be adapted in suitable sites to much of the Southeastern United States where 'Tibbee', 'Dixie', and 'AU Robin' crimson clover are grown.

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ESTABLISHMENT

'AU Sunrise' can be broadcast or drilled. For maximum cool season coverage, broadcast 20 pounds of inoculated seed per acre or drill 8-15 pounds of seed per acre. In North Alabama and Georgia, plant September 15 – November 1, in Northern South Carolina, plant September 1 – October 15, in Southern Alabama and Georgia, plant October 1 – November 15, in Southern South Carolina, plant September 15 – November 15. In North Carolina mountains, plant mid August – mid September, in North Carolina Piedmont, plant September 1 – September 30 and in North Carolina Coastal Plain, plant September 1 --October 15. Prior to planting, apply lime to raise pH to 6.0. Apply fertilizer as indicated by recent soil test results. Planting depth should be around ¼ inch.

MANAGEMENT

When it is time to kill the cover crop for conservation tillage planting, experience at Americus indicates that use of a systemic herbicide produces better results than a contact herbicide. Approximately two weeks after spraying, the cover crop should be dried sufficiently for proper summer crop planting. Due to earlier blooming characteristics, the summer crop can be planted 5-18 days earlier and 12 to 28 days earlier than when planting into 'AU Robin' or 'Tibbee' respectively.

DISEASE AND INSECTS

This cultivar does not have any particular resistance to disease or insects beyond those commonly found in the species.

COMMERCIAL SEED PRODUCTION

'AU Sunrise' can be harvested by direct combining. In Americus, Georgia, this is usually done from late April – early June. Normal yields are approximately 100 – 200 pounds of clean seed per acre. At Americus, the following combine settings were utilized on a 72 All Crop Harvester. Concave setting 1.0, cylinder speed 1200 rpm, fan setting of 2, tractor rpm 2400.

AVAILABILITY

Auburn University and Alabama Crop Improvement Association are working with interested companies to secure rights to the cultivar. Jimmy Carter Plant Materials Center and the Alabama Crop Improvement Association will maintain breeder seed stocks.

Cover Crops for the Southeast

ARMEX LUPINE *Lupinus elegans*

USES

This legume has shown considerable promise at both the Arcadia and Brooksville Plant Materials Centers as a winter cover crop. It produces good to excellent ground cover in young irrigated citrus groves in the Central and Southern parts of NRCS Area III and throughout NRCS Area IV. It is an excellent producer of honey nectar.

DESCRIPTION

Individual plants grow to four feet in height and to three feet in width. Growth is from a central stem which branches frequently. The blooming period lasts for several weeks commencing about mid-January and continuing to late March. Overall seed production is good, but the amount available for harvest at any one period is rather limited as the seed pods shatter readily upon reaching maturity. The seed produced is small, hard, persists well in the soil and volunteers readily in the autumn months. No disease problems have been known to seriously affect this plant at either Arcadia or Brooksville. It is a bitter blue variety and is unpalatable to livestock.

SOIL PREPARATION

Plow and/or disk the soil thoroughly followed by firm soil compaction while the soil is still moist.

FERTILIZATION

Fertilize with 300 – 400 pounds per acre with 0-14-14, 0-10-20, or 4-10-20 at or prior to seeding.

SEEDING RATE

25 pounds of seed per acre are required for broadcast seedings. 12 –15 pounds per acre should be used for row planting. Row planting results in more satisfactory inoculation and more rapid early growth. Inoculation is required regardless of planting method. Pack the soil firmly over either broadcast or row planted seed.

SEEDING DATE

The dates for planting seed is October 10 – 25.

IRRIGATION

This lupine can withstand moderate drought, but will grow considerably better if supplemental irrigation can be provided during droughty periods.

SEED HARVEST

Seed harvesting occurs from mid-March to mid-April depending upon location, soil, weather and plant conditions. The seed is harvested while much of the plant is still green. The crop is mowed when the optimum amount of nearly mature seed is

Cover Crops for the Southeast

present and is allowed to dry on the ground. When the leaves, pods and stalks are nearly dry the material is run through a conventional seed harvesting combine. More seed of this variety can be harvested by this method than by any other presently known method.

'AU EARLY COVER' HAIRY VETCH

Vicia villosa

INTRODUCTION

Earlier in this century legume cover crops were in wide use. Farmers utilized various legumes for green manure crops throughout the Southeastern United States because they provided excellent cover for the reduction of soil erosion and produced valuable nitrogen for subsequent crops. With the availability of cheap commercial fertilizers, the use of legumes for green manure crops declined. However, agricultural scientists have again begun to do extensive work with cool season legumes as cover crops in conservation tillage systems.

Much of the beneficial nitrogen produced by these legumes is assimilated by the time the cool season legumes flower. Therefore, it would be advantageous to develop various legume cultivars that display the early developing characteristics, since this would allow for more flexibility in conservation tillage systems. With this in mind, in 1994 the NRCS Americus Plant Materials Center and the Auburn University, Alabama Experiment Stations released an early developing hairy vetch called 'AU Early Cover'.

By mid February, when commercial hairy vetch has little growth, 'AU Early Cover' can have 150 to 200 pounds per acre of dry matter, therefore it can be utilized for conservation tillage earlier than commercial hairy vetch. This should produce enough ground cover for early plantings of conservation tillage systems. When this cultivar is harvested or incorporated about April 1, it has a dry matter yield of approximately 1500 pounds per acre.

The cultivar also flowers 20 to 30 days earlier than the latter developing hairy vetch (approximately the first week of April in Central Alabama and the Americus, Georgia area). In the upper Southern Coastal Plain it matures seed from mid-May to early June.

AREA OF ADAPTATION

The cultivar is adapted to the central and southern part of Alabama and Georgia. Preliminary reports indicate that this cultivar can grow north to Kentucky and Northern Mississippi and west to the Kingsville, Texas area. Further comparison testing will be done before the complete useful range of this cultivar is determined.

ESTABLISHMENT

'AU Early Cover' can be broadcast or drilled. For maximum cool season coverage, 30 pounds of inoculated seed per acre is recommended. Plant in the fall, it is usually planted around October 15 at Americus, Georgia (upper Southern Coastal Plain). In North Alabama it is planted from September 1 to October 15. In South Alabama it is planted from September 15 to November 1. Prior to planting, apply lime to raise pH to 6.0. Apply fertilizer as indicated by recent soil test results. Planting depth should be from ½" –1". Establishment in test and increase plots did not require use of a herbicide to enhance the vetch stand.

MANAGEMENT

When it is time to kill the cover crop for conservation tillage planting, experience at Americus indicates that use of a systemic herbicide produces better results than a contact herbicide.

Approximately two weeks after spraying, the cover crop should be dried sufficiently for proper summer crop planting.

DISEASE AND INSECTS

This cultivar does not have any particular resistance to disease or insects beyond those commonly found in the species. The Americus PMC applies an insecticide at 75% bloom and again two weeks later to control vetch weevil infestation in seed production fields.

COMMERCIAL SEED PRODUCTION

'AU Early Cover' can be harvested by direct combining. In Americus, Georgia this is usually done from mid April to mid May. Normal yields are approximately 300 – 400 pounds of seed per acre. At Americus the following combine settings were utilized on a F-2 Gleaner: Concave setting ½" and greater, cylinder speed 500 –600 rpm, fan setting of 5, run in second gear at full throttle.

AVAILABILITY

Auburn University and Alabama Crop Improvement Association are working with interested companies to secure rights to the new cultivar. Breeder seed stocks will be maintained by Americus Plant Materials Center and the Alabama Crop Improvement Association.

'AMERICUS' HAIRY VETCH

Vicia villosa

INTRODUCTION

Using legumes in crop rotations to enhance soil fertility, crop production and to reduce soil erosion is among the oldest of agricultural management practices.

Cover Crops for the Southeast

Conservation tillage cropping systems have the greatest potential for economically controlling sheet and rill erosion on cropland in the states served by the Americus, Georgia Plant Materials Center. There has been a need for well adapted annual cool season legumes that are compatible with conservation tillage systems. Legumes as a cover crop could potentially reduce erosion, fix nitrogen, and reduce moisture losses from evaporation.

NRCS and University of Georgia specialists have identified and released 'Americus' hairy vetch as a late maturing annual legume with excellent dry matter production and nitrogen accumulation. This new annual legume has potential for use as a winter cover crop in conservation tillage systems.

This plant was originally designated PI-383803 when it was evaluated with 1,000 other foreign and naturalized legume accessions at the Natural Resources Conservation Service, Plant Materials Center in Americus, Georgia. It was later evaluated by NRCS and University of Georgia personnel in several experimental field tests. These tests showed that 'Americus' has a consistent and often significant trend for greater dry matter production and N accumulations than other commercial hairy vetch tested.

AREA OF ADAPTATION

'Americus' is best adapted to well-drained soils of the Southern Piedmont and Southern Coastal Plain soil provinces of the Southeastern United States. Field observations indicate that 'Americus' can grow west to East Texas, north to Missouri and Kentucky and south to 29th north latitude.

ESTABLISHMENT

'Americus' can be broadcast or drilled. For maximum cool season coverage, 30 pounds of inoculated seed per acre is recommended. Plant 'Americus' in the fall, it is usually planted around October 15 at Americus, Georgia (upper Southern Coastal Plain). Planting dates for the Griffin, Georgia area (Southern Piedmont) are Oct. 1 – Nov. 1. Planting dates for the Tifton, Georgia area (lower Southern Coastal Plain) are Oct. 15 – Nov. 15. Prior to planting, apply lime to raise pH to 6.0. Apply fertilizer as indicated by recent soil test results. Planting depth should be from ½" – 1". Establishment in test and increase plots did not require use of herbicide to enhance vetch stand.

MANAGEMENT

When it is time to kill the cover crop for conservation tillage planting, experience at Americus indicates that use of a systemic herbicide produces better results than a contact herbicide. Approximately two weeks after spraying, the cover crop should be dried sufficiently for proper summer crop planting.

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A planting at Plains, Georgia indicates that corn following hairy vetch can be susceptible to southern corn rootworm infestation which can reduce corn stand. Insecticide can be applied to eliminate this possible infestation. No stand reduction was noticed when grain sorghum followed hairy vetch.

COMMERCIAL SEED PRODUCTION

'Americus' can be harvested by direct combining. In Americus, Georgia this is usually done from early – late June. Normal yields are approximately 400 pounds of seed per acre. At Americus the following combine settings were utilized on a F-2 Gleaner: Concave setting $\frac{1}{2}$ - $\frac{5}{8}$ ", cylinder speed less than or equal to 600, fan setting of 5, run in second gear at full throttle. Hairy vetch is usually infested with vetch weevil during bloom. This infestation can be controlled by treating with insecticide at 75% bloom and again two weeks later.

AVAILABILITY

The Natural Resources Conservation Service, Americus Plant Materials Center (PMC), Americus, Georgia is responsible for maintaining breeder seed. Limited quantities of seed are available to commercial growers through the Georgia Crop Improvement Association. For further information, please contact Donald Surrency, Plant Materials Specialist at the NRCS State Office, Federal Building, Box 13, 355 East Hancock Avenue, Athens, Georgia 30601. Telephone number (706) 546-2114.

'AU GROUNDCOVER' CALEY PEA

Lathyrus hirsutus

The use of legumes in forage and row crop production is nothing new to the Southeast, but many producers are expressing renewed interest in using legumes in place of commercial fertilizer to reduce production costs and protect the environment. Legume options will soon be expanded by the release of a new commercial caley pea cultivar – 'AU GroundCover'.

Natural Resource Conservation Service (NRCS) and AAES researchers developed 'AU GroundCover'. Although caley pea has been used for years as a livestock forage and cover crop in the Southeast, no commercial cultivars have been available. The only commercial source of seed has commonly been a mixture of vetch and caley pea.

Caley pea – also called wild winter pea, singletary pea, or rough pea – is a cool season annual legume introduced from the Mediterranean. Research has shown that forage yields in johnsongrass and dallisgrass hayfields increase more with caley pea than with any other cool season legume, and forage production season is lengthened when forages are grown in conjunction with this legume. Caley pea also is valuable as silage, a temporary ground cover, a green manure crop on land to be replaced in

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mid to late spring, and a source of food for wildlife. Caley pea grows well on the heavy clay soils of the lower Mississippi Delta and on calcareous clay soils of the Alabama and Mississippi Black Belt regions, where it is well adapted and readily reseeds.

The caley pea's hard seed coat allows natural reseeding when stands are not heavily grazed before the seed production period. Caley pea can be successfully grown in areas too wet or too calcareous for most annual clovers, but also is tolerant of mildly acidic soils.

Development of 'AU Ground Cover' began in 1983 when a collection of caley pea and other legume cover crops was assembled at the NRCS Americus Plant Materials Center in Georgia for initial screening evaluations. Selected ecotypes, or localized plant types, were tested for forage yield, maturity, canopy height, composition, and disease beginning in 1989. These tests were conducted in Americus and at AAES research units in Winfield, Belle Mina, Marion Junction, Tallahassee and Monroeville. The 'AU Ground Cover' cultivar was developed from these selections and evaluated. During these evaluations, 'AU Ground Cover' yielded as much forage as commercial hairy vetch and performed well in clipping trials at each location. 'AU Ground Cover' has a crude protein content of about 20% as flowering time and flowers at about the same time as hairy vetch. The plants have purplish flowers, light green foliage and develop canopies nearly 30 inches tall at flowering time. Studies indicate that initial growth is slow until late winter, when rapid growth begins. The results also show the scarified seed should be used to initially establish stands.

'AMCLO' ARROWLEAF CLOVER

Trifolium vesiculosum

SPECIES *Trifolium vesiculosum* 'Amclo' arrowleaf clover

ACCESSION NUMBERS FAO-4115, PI-234310, MS-630, F-896, AM-1452

ORIGIN

The arrowleaf clover was originally from Italy. It was received by the USDA-SCS in the fall of 1956 from the Plant Introduction Station, Experiment, GA. The seed were originally given to FAO by G. Lasiana, Professor of Botany, University of Rome, from a field collection made in the vicinity of Rome, Italy.

METHOD OF SELECTION

Direct increase of original seed after comparing it with three other accessions of the same species, and comparing it with crimson clover as a standard. It has been tested by the other plant materials centers in the Southeast, by other experiment stations,

and widely tested in field plantings. It was released in 1963 jointly by the USDA-NRCS and the Georgia Agricultural Experiment Station and named 'Amclo' (Americus clover).

DESCRIPTION

The plant is a cool-season, annual legume. It is more productive than crimson clover on sites and in climates adapted to both plants. Mature leaves of this species have a characteristic marking like an arrowhead, hence the name 'arrowleaf clover.'

The blossoms are in big heads, light yellow with some purple markings on the petals, and intermediate in length between crimson and red clover, but of greater diameter than red.

The plant is tall, reaching a maximum height of 36 inches and somewhat stemmy. Widely spaced plants will branch profusely with spreading branches which turn upright at the ends. Dense stands do not produce many branches. The seed are intermediate in size between crimson and white clover and contain a higher percentage of 'hard' seed from a combining operation. The seed are held in an inflated bladder-like structure and therefore are not prone to shatter badly. Amclo clover is 'early' in its maturity. At Americus, it is matured in June, about 3 weeks later than crimson clover. Other varieties of the arrowleaf clover are much later, some as late as July and others as late as August in reaching full maturity. Succeeding stands can be secured by volunteering where seed are matured and left in the field.

ADAPTATION

'Amclo' arrowleaf clover appears now to be best adapted to the Piedmont and Coastal Plains resource areas in Georgia, South Carolina, west Florida and southeast Alabama. It is not tolerant of wet soils and is the least hardy of the varieties studied. It is winter killed at temperatures approaching 0 degrees F. It should perform best in the portion of the Southeast where late spring droughts are common and thus restrict the production potential of later maturing varieties. It will give best results on well-drained soils having a good profile and containing some clay or slit.

USE

'Amclo' arrowleaf clover may be used as a reseeding pasture legume, cut and pelleted as hay, or as a cover crop.

COVER CROPS IN USE



AU-Sunrise for conservation tillage systems. Blooms and matures. Earlier than any crimson clover on the commercial market.



'Amclo' arrowleaf clover can improve the quality of warm season perennial grasses such as, bahia grass when interseeded in the fall. It can provide winter grazing when the warm season grasses are dormant.



Americus hairy vetch used as a cover crop for conservation tillage.



Wild turkeys range over a wide area. Winter annuals are good choices for food plots.



AU-Robin crimson clover used as a cover crop for erosion control and weed suppression in Christmas Tree production fields in Barnesville, Georgia.

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