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THE LUPIN DEVELOPMENT PROGRAM AT AUBURN UNIVERSITY, THE FIRST FIVE YEARS

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Summary

Autumn-sown, winter-type, sweet white lupin (Lupinus albus L.) is adapted to well-drained, low-fertility, coarse-textured, neutral to acidic soils of the South Atlantic and Gulf Coastal Plain Slope of the USA. Progress has been made to overcome production utilization constraints. Future research will include refinement of production parameters, long-term rotations, breeding of adapted cultivars, disease and pest management, animal utilization, and opening marketing channels.

Key words : *white lupin, Lupinus albus L., new crop, sustainable agriculture, research funding*

History

The Auburn University Lupin Development program began in 1988 with the investigation of three lupin species (*L. albus* L., *L. angustifolius* L., and *L. hispanicus* ssp. *bicolor* Merino) as an alternative winter cover crops. Subsequent tests showed that white lupin held promise as a green manure, silage, and grain crop for the southeastern USA. From 1988 to 1991 crop management factors (planting date, adaptation range, tillage-planting systems, and seed treatments) and germplasm introductions were evaluated. Out of this promising preliminary research an interest group of 13 researchers was formed, covering research in plant breeding, soil fertility, production practices, plant protection, and animal utilization. A unique characteristic of this endeavor is that the effort is completely driven by researcher's interest in the crop and not by administrative decree. The cooperation involves multiple disciplines from a number of university departments as well as researchers from the USDA Agricultural Research Service (USDA-ARS). The Wheat and Feed Grain commodity group of the Alabama Farmers Federation has supported the Lupin Development Project with $56000 since 1991. Results obtained through this commodity grant have also enabled competitive funding from USDA's Sustainable Agriculture Research and Extension (SARE) grant program. Two grants, totalling $382000 have been obtained to further study specific aspects of lupin management and utilization in cooperation with farmers and researchers in Alabama, Florida, Georgia, South Carolina, and Virginia. On-farm trials began in autumn 1994 and will be expanded in subsequent years. The largest on-farm area to date is a 12-ha field sown to a white lupin-oat (*Avena sativa* L.) binary mixture to be harvested for silage in spring 1995.

Progress

Research conducted from 1989 to 1994 concentrated on identifying production constraints and management practices for successful lupin cultivation. Temperature extremes constrain pod set to an 8-week period between mid March and mid May.The early date represents the average date for the last-2°C freeze and the latter the date on which normal high temperatures exceed 25°C. Cultivar choice and seeding date are primary production variables for maximum yield. Risk avoidance by farmers may well push the flowering date into early April, thereby further reducing the time available for pod set. White lupin cultivation in the southeastern USA will most likely succeed on well-drained soils of the South Atlantic and Gulf Coastal Plain Slope. With timely seeding, i.e., 6 to 8 weeks prior to the average date of the first -2°C freeze, winter survival has not been a problem during the last 5 years. Seeding rate (range 8-32 plants m^{-2} had little influence on grain yield in 90-cm rows with timely seeding. Wide rows (> 70 cm) allow the establishment of 10-cm high beds which aid in stand survival during the rainy winter month (total cumulative precipitation November to March is 650 mm). The most devastating disease organisms identified have been *Pleiochaeta setosa*, both root and leaf phase, and *Colletotrichum gloeosporioides*.

The latter organism causes anthracnose which completely destroyed one trial in South Alabama during spring 1994. Biological control agents against soil borne disease organisms have the potential to enhance yield (see Collins *et al.* in these proceedings). Average grain yields in tillage system and rotation studies have ranged from 600 to 1950 kg $ha^{-1}$with top yields exceeding 3900 kg ha^{-1}. Silage yields (35% dry matter) have ranged from 20 to 58 Mg ha^{-1}. Whole plant lupin forage ensiled in laboratory silos has developed satisfactory silage pH and a favorable lactic to acetic acid ratio.

Future research will focus on determining the developmental growth stage to obtain premium quality silage suitable for dairy rations. Initial results from test on long-term residual soil fertility sites in southern Alabma showed that grain and silage yields were restricted at soil pH levels less than 5.0. On a Benndale (Typic Paleudults) soil the highest yields were obtained at pH 6.4 with yields peaking at a Mehlich 1 (dilute double acid extraction) soil P level of 50 mg kg^{-1}.

Novel alternative double-cropping systems using lupin with grain sorghum (*Sorghum bicolor* (L.) Moench) or lupin with a new hybrid grain type pearl millet (*Pennisetum glaucum* (L.) R. Br.) show great promise.