THE BENEFITS AND CHALLENGES OF NARROW-LEAF LUPINE (*LUPINUS ANGUSTIFOLIUS*) BEFORE COTTON

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Abstract

Narrow-leaf lupine (also known as blue lupine) is a winter annual legume previously grown in the Southeast US to supply nitrogen for the subsequent summer crop. However, as fertilizer costs were reduced following World War II, growers abandoned production. As the search for potential cellulosic biofeedstocks continue, it is important that research addresses issues of growing these crops on marginal land (as not to compete with prime agricultural land used for fiber and food production) with minimal inputs (especially those that are based upon fossil fuels, like fertilizer). It is also critical to develop systems that will allow growers to maximize the use of existing agricultural equipment and fit in with traditional crop rotations. Studies were conducted in Tifton, GA to evaluate the influence of several winter legume species, rye, and non-cropped fallow plots on cotton grown in rotation with a bioenergy sorghum crop. Narrow-leaf lupine consistently had greater biomass (4,200 to 5,900 kg/ha of dry biomass) than other winter crops, including white vetch (1,000 to 3,770 kg/ha), winter pea (2,250 to 3,420 kg/ha), crimson clover (120 to 5,180 kg/ha), faba bean (<3,460 kg/ha), and rye (600 to 3,230 kg/ha). All of the winter legumes retuned nitrogen to the soil, but narrow-leaf lupine provided the highest amount (115 to 135 kg/ha of N). Other legumes provided lower levels of nitrogen; white vetch (23 to 99 kg/ha N), crimson clover (<68 kg/ha N), and winter pea (50 to 111 kg/ha N). The level of weed suppression from various cover crops will likely be a function of the amount of physical suppression the rolled plant mulches can provide. The specific leaf area of each dried cover crop suggested that narrow-leaf lupine (16 cm^2/g) would not provide as much suppression as winter pea (66 cm^2/g) or rye (46 cm^2/g). However, when the narrow-leaf lupine specific leaf area value is multiplied by biomass production per area, it is estimated that there is 1.2 cm^2 of mulch area per cm^2 of land area, which is about a third less than the values from winter pea (3.3 cm^2 mulch/cm^2 land) and rye (3.6 cm^2 mulch/cm^2 land), but similar to crimson clover (1.3 cm^2 mulch/cm^2 land). Cotton yields following narrow-leaf lupine were equivalent to those following rye in one year and more than double that of rye in another year. Narrow-leaf lupine inoculated with 8,000 proved to be a host for root-knot nematode (*Meloidogyne incognita*) with 55,000 eggs recovered after one generation (6.9-fold increase), while cotton had 117,000 eggs (14.5-fold increase). In South Georgia, it is estimated that two generations could be produced on narrow-leaf lupine. Narrow-leaf lupine was also associated with higher levels of insects, including parasitoids, predators, and pests (i.e. thrips and cinch bugs). Narrow-leaf lupine appears to be a beneficial part of low-input crop rotation, but nematode issues must be monitored and weed control must be supplemented.