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Sustainable Agriculture
Cover Crops
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Carpetgrass

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Farmers practicing sustainable agriculture in orchard crops face the challenge of establishing cover crops under shaded conditions. Carpetgrasses (*Axonopus affinis*, narrowleaf carpetgrass, and *Axonopus compressus*, broadleaf carpetgrass) have successfully filled this niche on several farms in Hawaii. This low growing, mat-like grass is being used successfully between rows of coffee trees in Kona, with the more wear-resistant 'Tropic Lalo' paspalum (*Paspalum hieronymii*) grown on access roads and equipment-bearing areas. In other areas of the tropics, the carpetgrasses are routinely grown and grazed under oil palm, rubber, and coconut. These plants are excellent choices for use on low fertility soils.

Benefits provided by carpetgrass

Excellent for controlling erosion, suppressing weeds (once established)

Tolerates acidic and low fertility soils

Good to fair shade tolerance, with broadleaf carpetgrass being very shade tolerant

Use in plantation and orchard cropping systems (macadamia, coffee, coconut) and under deep shade

Characteristics

Carpetgrass is a native of Central America and the West Indies. The creeping stems of carpetgrass are compressed and root at each joint. Broadleaf carpetgrass and narrowleaf carpetgrass cannot be easily distinguished from one another by their general appearance because the leaf width can vary and hybridization can occur. Carpetgrass spreads by both stolons and seed.

Narrowleaf carpetgrass is a warm-season, perennial, stoloniferous, short, spreading grass. Its leaves are 2–8 inches (5–20 cm) long and 1⁄16–1⁄4 inch (2–6 mm) wide. It ranges in height from about 10 to 30 inches (25–75 cm), forming a dense mat over the ground surface. The fertile floret is white to pale-yellow.

Broadleaf carpetgrass is a short, perennial, stoloniferous, dense, mat-like, spreading grass. It grows to a maximum height of about 8–20 inches (20–50 cm). Its leaves are 1½–6 inches (4–15 cm) long and 1⁄8–3⁄8 inch (4–10 mm) wide and are broadly linear or lanceolate. It seldom reaches a height greater than 6 inches (15 cm). There are usually two to four slender, dense spikes, 1–4 inches (3–10 cm) long. Broadleaf carpetgrass is similar to narrowleaf carpetgrass in most of its botanical characteristics but is more robust and has more stolons.

Environmental requirements

Carpetgrass grows on a range of soil types and is particularly well adapted to sandy soils with a high water table, where it outcompetes other grasses as soil fertility declines. This grass occurs in tropical and subtropical areas. Carpetgrass requires a minimum annual rainfall of about 30 inches (750–775 mm). It is not drought tolerant. Even though it thrives under moist conditions, it cannot withstand waterlogging or flooding. Narrowleaf

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carpetgrass has fair shade tolerance, whereas broadleaf carpetgrass is very shade tolerant, making it a good choice as an understory in orchards, but it also grows well in full sunlight. Carpetgrass tolerates soil pH from 4.0 to 7.0. In Hawaii, narrowleaf carpetgrass grows year-round at elevations from sea level to 2000 ft, and broadleaf grows year-round at elevations from sea level to 3000 ft, according to the USDA Natural Resources Conservation Service (NRCS).

Establishment

Propagation

Narrowleaf carpetgrasscan be seeded or vegetatively propagated by planting stolons. Broadleaf carpetgrass is usually only propagated vegetatively by stolons.
Seeding rate (narrowleaf carpetgrass only).

Broadcast at least 40 lb/acre pure live seed and harrow or roll to achieve a minimal soil cover.

For vegetative establishment, winter and early spring planting are preferred. Both narrowleaf and broadleaf carpetgrasses can be vegetatively propagated. NRCS recommends a planting rate of 40–80 bu/acre (sprigs or stolons, with a maximum 3 x 3 ft spacing). No seed is available for broadleaf carpetgrass, and it must be established vegetatively.

Establishment is most successful in a well prepared seedbed. Seedbed preparation may be minimal, using herbicides or disking, or both, to control weeds.

The areas to be planted must be moist and irrigated, as the sprigs and newly established plants are susceptible to drought.

Although carpetgrass establishes fairly quickly, some weed control may be required during establishment.

Uses

Weed control

Once established, carpetgrass smothers out weeds with its mat-like growth habit, making it a good tool for reduced-chemical or no-chemical weed control.

Erosion control on slopes and in shaded orchards

Once established, carpetgrass is an effective soil conservation tool to preserve valuable topsoil on sloping fields. Broadleaf carpetgrass can grow under shady conditions, making it a valuable cover crop in mature orchards with a fuller canopy cover.

Soil quality improvement

Important soil quality benefits such as improved soil structure, better water infiltration rates, and increased soil water-holding capacity are some of the benefits of using permanent cover crops such as carpetgrass.

Grass/legume mixtures

Farmers often mix two or more cover crops to combine the complementary benefits provided by grasses and legumes. When well designed, this method of crop diversification tends to reduce the farmer's risks from soil, pest, and weather problems. Possible combinations include broadleaf carpetgrass intercropped with white clover (*Trifolium repens*), trefoil, or desmodium. In the long run, narrowleaf carpetgrass tends to outcompete legumes, especially under low fertility conditions.

Rotational grazing

Although carpetgrass herbage is considered to be a low quality forage, it does offer viable pasture options for additonal income, especially on low fertility soils where more productive forages are not an option. To optimize forage quality for rotational grazing, intercrop carpetgrass with a legume. In many developing countries, carpetgrasses are routinely grazed in plantation crops, particularly under coconuts.

Cover crop maintenance

Carpetgrass requires little fertilizer and is considered a low maintenance grass. Some research indicates that broadleaf carpetgrass can fix atmospheric nitrogen and can add this nutrient to the soil.

Management cautions

The initial cost of establishing broadleaf carpetgrass is high because it cannot be grown from seed and must be sprigged by hand. Carpetgrass is a low quality forage for animal grazing systems from a production, nutritional quality, and palatability standpoint.

Pest problems

Several farmers in the Kona region of the island of Hawaii report using broadleaf carpetgrass with white clover under coffee. There are anecdotal reports that carpetgrass and coffee are both susceptible to root-knot nematode. Broadleaf carpetgrass is reported to be susceptible to burrowing, reniform, and root-knot nematodes. It is also an alternate host of *Rhizoctonia solani*, an important soil-borne disease of many crops in Hawaii. Carpetgrass is excellent for weed suppression, but it can become a troublesome weed itself if it invades old, run-down, unfertilized pastures.

For assistance:

Contact your nearest Cooperative Extension Service office for additional assistance in selecting appropriate cover crops and green manures for your farm and cropping situation. Help can also be obtained from the USDA Natural Resources Conservation Service field offices located on each island.

Visit CTAHR's Sustainable Agriculture for Hawaii Program Website at <http://www.ctahr.hawaii.edu/sustainag> to find additional information about green manure and cover crops. The site also includes references and links to other useful on-line resources.

Sustainable Agriculture in Hawaii . . .

. . . integrates three main goals—environmental health, economic profitability, and social and economic equity. Sustainable farms differ from conventional ones in that they rely more on management practices such as crop diversification and crop rotation, agroforestry, integrated pest management, rotational grazing, and innovative marketing strategies. For further information on Sustainable Agriculture in Hawaii, contact:

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