

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 IJABR 2023; SP-7(2): 41-50
www.biochemjournal.com
 Received: 23-05-2023
 Accepted: 28-06-2023

Tarun Kumar
 Ph.D. Scholar, Department of
 Floriculture and Landscape
 Architecture, Indira Gandhi
 Krishi Vishwavidyalaya,
 Krishak Nagar, Raipur,
 Chhattisgarh, India

Saurabh
 Ph.D. Scholar, Department of
 Vegetable Science, Indira
 Gandhi Krishi
 Vishwavidyalaya, Krishak
 Nagar, Raipur, Chhattisgarh,
 India

Manisha
 Ph.D. Scholar, Department of
 Horticulture, Chaudhary
 Charan Singh Haryana
 Agricultural University, Hisar,
 Haryana, India

Corresponding Author:
Tarun Kumar
 Ph.D. Scholar, Department of
 Floriculture and Landscape
 Architecture, Indira Gandhi
 Krishi Vishwavidyalaya,
 Krishak Nagar, Raipur,
 Chhattisgarh, India

Lawn grasses and their method of establishment: A review

Tarun Kumar, Saurabh and Manisha

DOI: <https://doi.org/10.33545/26174693.2023.v7.i2Sa.189>

Abstract

The lawn is the heart of the garden. In many different regions of the world, these are seen as an integral aspect of private gardens, public landscapes, and parks. The charm and beauty of the decorative plants and features are best appreciated in the forefront of a lawn. As well as for sports or other outdoor leisure activities, they are sometimes produced for purely aesthetic reasons. They are divided into two groups, cool-season grasses and warm-season grasses, depending on the climatic conditions. In the review, description of varieties or species, establishment method of different turf grasses, importance and uses of warm season grasses namely Bahia grass (*Paspalum notatum*), Bermuda grass (*Cynodon dactylon*), Blue Grama (*Bouteloua gracilis*), Buffalo grass (*Buchloe dactyloides*), Carpet grass (*Axonopus afinis*), Centipede grass (*Eremochloa phiuroides*), Kikuyu grass (*Pennisetum clandestinum*), St. Augustine grass (*Stenotaphrum secundatum*) and Zoysia grass (*Zoysia spp.*) and cool season grasses like Alkali grass (*Puccinella distans*), Annual Blue Grass (*Poa annua*), Creeping Bentgrass, (*Agrotis stolonifera*), Fine Fescues, Kentucky Blue Grass (*Poa pratensis*), Perennial Rye Grass (*Lolium perenne*), Rough Blue Grass (*Poa trivialis*), Tall fescue (*Festuca arundinacea*), Velvet bent grass (*Agrotis canina*) and Wheatgrass (*Agropyron spp*) and different method of establishment like a seedling, sodding, stolonizing, plugging, hydro seedling, dibbling, Astroturf are discussed in details.

Keywords: Lawn, grasses, season, establishment, recreational, and aesthetic advantages

Introduction

Turf grasses are regarded as an essential component of landscape architecture in India, where it has developed into a lucrative industry. It adds beauty, promotes aesthetic value and improves ecological equilibrium. Turf grasses are made up of a very broad set of plants that are used only in certain applications or climates (Janakiram and Namita, 2014) [12].

The old French term "Laund", which means "Wooded district", is where the word "Lawn" originates. The floor of an outdoor room is covered with a green carpet that is natural in colour. The family Poaceae is home to the primary turf species of interest. With more than 1334 species falling within 261 genera, turf grasses are India's most biologically diverse family (Karthikeyan, 2005) [25]. This is equivalent to about 14% of all grass species worldwide. It serves as the focal point of the garden and the centre of social interaction (Jenkins, 1994) [15]. The turf is a safe location to play, has a nice aesthetic, and improves the environment.

Turfgrasses are made up of a very broad set of plants that are used only in certain applications or climates (Janakiram and Namita, 2014) [12]. In the industrialized parts of the world, turf grass is a common sight in metropolitan settings. Turf grasses are widely utilized around the world to improve and maintain the usefulness and aesthetics of lawns, aesthetic fields, etc. (Agnihotri R, and SL Chawla, 2017) [1-3].

Important

Lawns and other grass areas are important resources because they increase open space, offer recreation, increase property value, and support environmental protection. The following list summarises the numerous functional, recreational, and aesthetic advantages that well-maintained turf offers.

Table 1: Importance of turf grasses

Functional	Recreational	Ornamental
Dust and mud control Entrapment of pollutants Environmental protection Fire prevention Glare reduction Groundwater recharge Slope stabilization Heat abatement Noise abatement Security-visibility Soil loss and erosion control Protection of underground utility services Greenhouse gas reduction Storm water abatement	Safe playing surfaces Low-cost surfaces Mental health Physical health Entertainment	Beauty Increased property value Community pride Complements the landscape of Mental health

Classification of important turf grasses

1. Warm season

Warm-season grasses, including zoysia grass, Bermuda grass, St. Augustine grass, Bahia grass, carpet grass, buffalo grass, and grama grass, flourish in temperatures between 25 and 35 degrees Celsius (De, 2013) ^[9].

1.1 Bahia grass (*Paspalum notatum*)

Mexican and South American countries are the origins of Bahia grass. This grass has a rhizome, is low-growing, and creeps. A dense sod is created by the stolons, which are securely linked to the ground and root freely from the internode. The large, flat, globous leaves have a rough feel. The stems are 20-75 cm in height. The V-shaped inflorescences have two spikes in each.

Varieties: Diploid cultivars: 'Pensacola', 'Tifton 9', 'TifQuik', and 'UF-Riata'. Tetraploid varieties: 'Paraguay', 'Argentine', and 'common'.

Importance and uses

It is largely employed for the production of hay and pasture for the management of animals. Wildlife habitat, erosion control, phytoremediation of soils with phosphorus contamination, and integrated pest management of nematodes and fungi diseases, when utilised in rotation with annual crops, are some other uses. Bahia grass is a turf that resists drought.

1.2 Bermuda grass (*Cynodon dactylon*), (Fishel and Coats, 1994; Samples and Sorochan, 2007) ^[19]

It is an African native. Dub grass is a perennial that forms dense sods and spreads through stolons, rhizomes, and seeds. The nodes quickly sprout stolons. At the nodes, lateral buds emerge to produce 5-40 cm tall, erect or ascending stems. In the majority of *Cynodon* species, leaves are placed on stems in multiple-leaved nodes, which are formed by long internodes alternating with one or more very short internodes. Leaf-sheaths are up to 15 cm long, spherical, loose, divided, smooth, and sparsely haired. There are no auricles. Continuous, small, glabrous, and hairy on the margins describe the collar. Sharp leaf blades that are folded or lightly coiled in the bud range from being smooth to sparsely hairy. Lemma is boot-shaped, sharp, and longer than the glume; the seed is oval, straw to crimson in colour, and free within the lemma and palea.

Seeded varieties

'Jackpot', 'U-3', 'Aanta Anna', 'Ormud', 'Uma', 'Princess-77', 'Sahara', 'Savannah', 'Sultan', 'Sundance',

'Sydney', 'Triangle Blend', 'Yukon', 'La Prima', 'Riviera', 'Common', 'Giant' and 'Transcontinental'.

Hybrids

Hybrid Bermuda grasses are the progeny of interspecific crosses of *Cynodon dactylon* and *Cynodon transvaalensis*. These hybrids are seed sterile and should be propagated by sprigs, stolons, or sodding. Popular hybrids are 'Sunturf', 'Celebration', 'GN-1', 'Tifway', 'Tifway-II', 'Tifgreen', 'Tifdwarf', 'Tifsport', 'Tiflawn', 'Pee Dee', 'Tifton 44', 'Tifton 68', 'Tifton 85', 'Tifton 78', 'Coastal'.

Ultra-dwarf hybrids: 'Floradwarf', 'Miniverde'.

Importance and uses

It is utilised to stop soil erosion, stabilise ditch banks, road edges, and airfields, enhance landscapes, and offer a level, durable playing surface for playgrounds and sports fields. The world's tropical and subtropical regions also generate hay and pasture for livestock using Bermuda grass. Common Dub grass is used for a variety of general-purpose turf applications, including sports fields, lawns, playgrounds, parks, golf course fairways, and cemeteries. For specific applications such as sports fields, golf greens, bowling greens, tennis courts, and lawns. Bermuda grass that is densely packed can recover fast from moderate wear and compaction. This species produces a dense, robust turf grass stand that can withstand both traffic and drought stress.

1.3 Blue Grama (*Bouteloua gracilis*)

The U.S. Great Plains are covered in the tropical, rhizomatous, native grass known as "Blue grama." It stands 15 to 30 cm tall and has flat leaves with a point at the end. The leaves measure 3 mm in diameter and 2.5 to 25 cm long. They range in height from 17 to 46 cm. Perched on the end of the flower stem, the blossoms have the appearance of crescent moons. Each flower has 20 to 90 tiny spikelets.

Varieties: 'Lovington', 'Hachita', 'Alma'.

Importance and uses

In sandy soils, it grows nicely. Blue grama grasses have high drought and cold tolerance, much like buffalo grass. Blue grama can be grown up to at elevations nearing 7000 feet, while being prevalent at lower altitudes. It is typically planted to help golf courses naturalise their distant roughs. Unmoved turf made of blue grama is quite lovely. Blue grama grasses can tolerate moderate alkalinity, acceptable

salinity, and good dryness. Blue grama makes a wonderful grass for grazing because it recovers well on stem.

1.4 Buffalo grass (*Buchloe dactyloides*), (Beard and Kim, 1989) [26]

It is a perennial grass that was first seen in Mexico and Montana. Buffalograss is a 20–25 cm long, low-growing tropical grass. Although the individual leaf blades are between 25 and 30 cm long, they tumble over and give the turf a short appearance. Buffalograss is stoloniferous, with both staminate and pistil late blooms, and curly leaves. Staminate plants have 2 to 3 one-sided, flag-like spikes on a 10 to 15 cm high seeds talk. Usually 10, spikelets are 4 mm long and are arranged in two rows on one side of the rachis. Pistil late spikelets are contained in the inflated sheaths of the top leaves and are produced in a short spike or head.

Varieties: Seeded varieties: Bison, Bowie, Cody, Plains, Topgun, Sharps Improved, Tatanka, Texoka.

Vegetative varieties

Prairie, 609, Legacy, Prestige, Turffalo, Midget, Mobuff, Stampede, '315,'378', Bonniebrae,

Importance and uses

Buffalograss is a crucial part of the shortgrass and mixed grass prairies and is mostly used for range grazing. All types of livestock eat Buffalograss. It is regarded as high-quality fodder, and curing has little effect on its nutritional value. As a possible replacement for exotic warm-season grasses like Bermuda grass (*Cynodon dactylon*), St. Augustine (*Stenotaphrum secundatum*), and zoysia (*Zoysia japonica*), buffalograss is becoming more and more popular for use in low traffic regions. Soil erosion is slowed down by the dense sod that Buffalograss creates.

1.5 Carpet grass (*Axonopus finish*)

The West Indies and Central America are where carpet grass first appeared. At each junction, the compressed creeping stems root. Perennial, stoloniferous, short, spreading grass called narrow leaf carpet grass. The size of a leaf is 5–20 cm long and 2–6 mm wide. Plants cover the ground in a dense mat that ranges in height from 25 to 75 cm. The white to pale-yellow floret is viable. A short, perennial, stoloniferous, dense, mat-like grass called broadleaf carpet grass. It can grow as tall as 20 to 50 cm at its tallest. The leaves are generally linear or lanceolate and measure 4–15 cm in length by 4–10 mm wide. Typically, there are two to four long, thick spikes. Most of the botanical properties of broad-leaf carpet grass are similar to those of narrow-leaf carpet grass, although it is more robust and has more stolons.

Importance and uses

For parks, roadside vegetation, and golf course roughs, carpet grass performs best in subtropical and tropical climates and tolerates poor soil conditions. Carpet grass is resistant to abrasion, cold weather-tolerant, and moderately tolerant of shade.

1.6 Centipede grass (*Eremochloa ophiuroides*)

It is a plant that is endemic to Southern China and is also called "Chinese Lawn Grass". This creeping perennial has compressed sheaths and is stoloniferous. The leaves have a

conspicuously flat, white median and measure between 1.5 and 3.0 cm in length and 2 to 4 mm in width. With the exception of the collar areas, the leaves are smooth. The leaves have a short, membranous, hairy ligule and are auricle less. A single raceme-shaped inflorescence of 37.5 cm to 12.5 cm in length is present. The spikelets are grouped in two rows and the racemes are flattened and reddish in colour.

Varieties

'Oklaw'n', 'AU Centennial', 'Common', 'Hammock', 'Tifblair', 'Raleigh', 'Tennessee Hardy', 'Covington',

Importance and uses

It is an aggressive, medium-textured grass that grows slowly and creates a dense, lovely, and weed-free lawn. Because of its tendency to run on the ground, it is simple to regulate around the edges of flower beds and walkways. The best grass is that which requires minimum maintenance and is grown in full or partial shade. Compared to other turf grass, it often requires less mowing and fertiliser or lime.

1.7 Kikuyu grass (*Pennisetum clandestinum*)

East Africa is its native region. Kikuyu is a rhizomatous perennial that grows 30 to 70 cm tall, has many branches on its stolons, and creates a turf that is frequently defoliated. The sterile shoots have long leaves and small stems. Compared to sterile shoots, which have shorter leaves, fertile shoots grow more slowly. Pale leaf sheathing Yellow-green, typically with fine, dense tubercular hairs; occasionally with a smooth or hairy ligule. When young, the linear, 30 cm long by 7 mm wide leaf blade is tightly folded; however, as it ages. An altered inflorescence now consists of a group of 2-4 very short-stalked spikelets that are almost completely encased in the topmost leaf sheath. Spikelets are 10-20 mm long, thin, and contain two florets - the upper one is bisexual or functionally male or female, and the bottom one is sterile. Caryopses are pointy, ovoid, dark brown, about 2.5 mm Long, and 1.5 mm Wide.

Varieties: 'Kabete', 'Whittet', 'Breakwell', 'Hosaka' (Hosaka, 1958) [27].

Importance and uses

Due to its low cost and drought resistance, this lawn grass is highly popular in Southern California, Australia, New Zealand, and South Africa. Additionally, it can be helpful in a pasture for heavy animal grazing and provides food for a variety of birds. Due to its quick repair capabilities, Kikuyu is employed in the community's most heavily used and trafficked places.

1.8 St. Augustine grass (*Stenotaphrum secundatum*) (Trenholm et al., 2006) [23]

It is known as "Charleston grass," a warm-season turfgrass with a coarse texture that is appropriate for hot, humid climates. This turf grass is indigenous to the Mediterranean and Gulf of Mexico coasts. Rhizomes are absent from it. In general, stems and overlapping leaf sheaths are crushed. The sheaths are severely compressed and ciliate along the margins, and the collar petiolate and leaf blades are typically folded, abruptly constricted at the base, rounded at the tip, and glabrous. The ligule has been transformed into a small fringe of hairs. The inflorescence is borne in spike-like

racemes and spikelets embedded in the main axis, with some also being axillary and terminal in occurrence.

The inflorescence is borne in spike-like racemes and spikelets embedded in the main axis, with some also being axillary and terminal in occurrence. Each raceme has 1-3 sessile, awn less, lanceolate, or ovate spikelets. Caryopsis fruits are ovate to oblong,

Varieties: Standard cultivars: 'Bitterblue', 'Classic', 'Deltashade', 'Floritam', 'Palmetto', and 'Raleigh'.

Dwarf cultivars: 'Captiva', 'Delmar', 'Sapphire'.

Importance and uses

St. Augustinegrass is extremely shade tolerant compared to other warm-season turf grasses and can produce a high-quality turf grass in shaded locations. St. Augustinegrass is more suited for coastal locations since it is more salt tolerant. St. Augustinegrass can be propagated using sod, sprigs, or plugs and takes root quickly and easily. It is frequently helpful in a variety of soils in lawns and other landscaped areas at homes.

1.9 Zoysia grass (*Zoysia spp*)

Introduced from Asia, zoysiagrasses (*Zoysia spp.*) are beautiful turf-forming plants in the United States. Numerous zoysia grass species and cultivars are used for lawns in private residences. The look, colour, growth pattern, and texture of these species and cultivars vary significantly (Unruh *et al.*, 2006; Samples and Sorochan, 2007) [24, 19].

1.9.1 Japanese or Korean Lawn grass (*Zoysia japonica*)

This zoysia grass species has a texture that is quite rough, similar to tall fescue, is hairy, light green in colour, grows considerably more quickly than other zoysia grass species, and is exceptionally cold tolerant. However, a lawn should not be planted with this variety of zoysia grass. The only zoysia grass species that can be grown from seeds is the Japanese Lawn grass, however, nematodes and the billbug that hunts them are likely to harm them. The most cold-tolerant of the zoysia grasses, it has medium-sized leaves and a dark green tint. However, it is less shade-tolerant.

1.9.2 *Zoysia japonica*

'Meyer' zoysia grass: Z-52 and Meyer zoysia grass are two well-known varieties. Z-52 is referred to as Z-52 or amazoy sometimes. Meyer, a better variety of *Zoysia japonica*, was created in 1951. It is the most cold-tolerant zoysia grass and has medium-sized, dark green leaves;

1.9.3 Matrella Zoysiagrass or Manilagrass (*Zoysia matrella*)

Manila grass is the best choice for a high-quality, high-maintenance lawn because it resembles bermudagrass in colour, texture, and quality. This zoysia grass species, which is an introduction from China, produces a finer and denser lawn than the cultivars of *Zoysia japonica*, although it is less cold tolerant. *Zoysia matrella* is extremely susceptible to nematode damage. The Alabama Agricultural Experiment Station at Auburn University released a variety of *Zoysia matrella*, evaluated as FC 13521, which is now referred to as *Matrella zoysia grass*. Compared to Meyer zoysia grass, Matrella has finer-textured leaves and can tolerate more

shade; nevertheless, it cannot tolerate as much shade as *Emerald zoysiagra*.

1.9.4 Mascarenegrass (*Zoysia tenuifolia*)

This type of zoysia grass has the finest texture and a decent amount of wear tolerance, but it has the potential to grow quite thick thatch, giving it a "puffy" appearance. Additionally, it is the least tolerant of the zoysia grass

1.9.5 *Emerald Zoysiagrass: Emerald zoysiagrasses*

Zoysia japonica and *Zoysia tenuifolia* were crossed to create emerald zoysia grass, which was created in 1955. This hybrid zoysia grass combines the fine texture and density of one parent with the cold tolerance, colour, and rapid growth rate of the other parent. Although it has a very fine leaf texture, good cold tolerance, good shade tolerance, good wear resistance, and a dark green colour, it does not have Meyer zoysia grass cold tolerance. This zoysia grass performs well in lawns of superior grade when properly maintained. Emerald is prone to diseases including brown patch, dollar spot, and leaf spot as well as thatch build-up and "Puffiness".

Varieties of *Z. japonica*: 'Zenith', 'Compadre'.

Vegetatively propagated selections. *Z. japonica* selections: 'El Toro', 'Meyer', 'Palisades'.

Z. matrella selections

'Cavalier', 'Diamond', 'Zeon', 'Zorro'.

Interspecific hybrids: 'Emerald', 'Z-3'.

Other improved varieties: 'De Anza', 'Empire Zoysia', 'JaMur', 'Toccoa Green', 'BA-189'.

Importance and uses

For residential and commercial landscapes, sporting fields, and the tees, fairways, and roughs of golf courses, a multitude of species and variations of zoysia grass are used. These turf grasses have good cold, shadow, and salt spray tolerance. Once established, zoysia grasses produce incredibly dense, slowly expanding sod that can inhibit the spread and population of weeds. They need less frequent mowing than other turf grasses because of their slow growth.

Cool season

Cool-season grasses include

The growth of cool-season grasses requires temperatures between 10 and 25 degrees Celsius, and they maintain their colour even in extreme cold. Examples include feather Alkali grass (*Puccinella distans*) reed grass (*Calamagrostis spp.*), bentgrass (*Agrostis spp.*), ryegrass (*Lolium spp.*), bluegrass (*Poa spp.*), hybrid fescues (*Festuca spp.*), red fescues (*Festuca rubra*), and tufted hair grass (*Deschampsia spp.*) (De, 2012) [8].

2.1 Alkali grass (*Puccinella distans*)

This grass is originally from the Great Plains, the Western and North-eastern United States, and Canada. Low-growing, erect, perennial bunchgrass with a chilly season. The fluffy, semi-prostrate panicle seed heads are present. Culms form a loose, matted turf that is 30-45 cm tall. The leaves are long

and dark green. Alkali grass can endure sporadic flooding thanks to its aggressive, shallow root system.

Varieties: 'Fults'.

Importance and uses

The importance of this grass and its applications include turf on saline-alkaline soils, fairway roughs, and roadside stabilisation. On saline and alkaline soils, it functions best as a ground cover. For thick upright stands and playable fairways, it can be harvested at a height of 1.0-1.5 cm; for golf course roughs, landscaping, and lawns, it can be harvested at a height of 5 cm.

2.2 Annual bluegrass (*Poa annua*) (Johnson *et al.*, 1993)^[28]

It is indigenous to Eurasia and is thought to be a tetraploid cross between *Poa supina* and *Poa infirma*. It has a fibrous, slightly creeping rootstock. The 20–25 cm stems are tall. The triangular panicle measures 5.5 to 7.5 cm in length. At flowering, the stalked but awnless spikelets are 1 to 2 cm in length and are loosely carried on delicate paired or spreading branches. They can have a purple tint to them. The leaves are bright green, velvety, drooping, and short at the tips. Long sheaths encircle the stems and hold them. The leaves have coarsely serrated margins and are globous above and below. The leaf margins can occasionally have transverse serrations. Acute, sharp, and silvery describe the ligule.

Varieties: *Poa annua* L var. annual (winter annual) and *Poa annua* L. var. reptans (Short lived perennial).

Importance and uses

This tufted, annual winter grass has a low growth rate and is commonly found in fields, lawns, and other roadsides. The perennial forms thrive in closely mowed regions like golf courses and pastures, where the annual variety predominates in cultivated areas.

2.3 Creeping Bent grass (*Agrotis stolonifera*) (Beard, 1973; Pennucci and Langille, 2005)

Is indigenous to North America and Eurasia. The grass has a very fine texture and is an intense shade of green. The leaves are tall, tapering, ligulate, and slender, coiled in a bud without an auricle. Creeping bentgrass is a grass with a shallow root structure that grows slowly. By creating a mat or thatch layer above the soil line, it spreads by stolons. The spikelets are red and tightly closed within the panicle, and the grass is not tufted. Allotetraploid Creeping Bentgrass has chromosomal number $2n = 28$. It can produce interspecific hybrids due to cross-pollination (Dickinson, 1930; Warnke, 2003)^[29, 30].

Varieties (Alderson and Sharp, 1995)

Vegetatively established cultivars: 'Arlington (C1)', 'Cohansey', 'Columbia', 'Totonto', 'Congressional', 'Collins', 'Metropolitan', 'Northland', 'Pennlu', 'Pennpar', 'Springfield', 'Vermont', 'Virginia', 'Washington', 'Dahlgreen'.

Seeded varieties

'Seaside', 'Penncross', 'Penn A-1', 'Penn A-4', 'Penn G-1', 'Penn G-2' and 'Penn G-6'.

Varieties with fine leaf texture

'Authority', 'Century', 'Declaration', 'Penn A1', 'Penn A2', 'Penn A 4', 'Penn G1', 'Penn G2', 'Penn G6', 'T1', and 'Tye'.

Varieties with coarse leaf texture

'Penncross', 'Pennlinks', 'Putter', 'Trueline', 'Seaside'. λ High-density cultivars: 'Authority', 'Benchmark DSR', 'Declaration', 'T-1' and 'Tye'.

Moderate density cultivars

'Alpha', 'Independence', 'Kingpin', 'LS-44', 'Memorial', 'Penneagle II', 'Pennlinks II' and 'SR1150'.

Standard and improved types

'Backspin', 'Bengal', 'Cato', 'Century', 'Cobra', 'Crenshaw', 'L-93', 'Ninety-six Two', 'SR1019' ('Providence'), 'SR 1020' ('Tapiz'), 'SR 1119', 'SR1120' ('Brighton'), 'Penneagle', 'Pennlinks', 'Princeville', 'Putter', 'Grand Prix', 'Sandhill', 'Seaside II', 'Trueline' and 'Viper'.

Low-density cultivars

'Cobra', 'Penn cross', 'Seaside', 'Viper', 'Seaside'. λ

Brown patch tolerant varieties

'Century', 'Authority', 'Imperial', 'Memorial', 'Penn G-1', 'Sandhill', 'Declaration' and 'Tye'.

Dollar spot-tolerant varieties

'007', '13M', 'Declaration', 'Kingpin', 'Memorial', 'Pennlinks'

Importance and uses

This cool-season grass is mostly utilised in lawn tennis courts, lawn bowling greens, and golf course putting greens. It grows best in sunny locations but is tolerant of slight shade. It is well adapted to cool, humid climates. Although it can tolerate cold temperatures, it will turn brown in the early winter.

2.4 Fine fescues

Fescues are a sought-after variety of grass due to their adaptability to various climatic conditions, which includes their popularity for their drought and shade tolerance. The ability of fescue grasses to remain green throughout the year only increases its appeal as a kind of turf grass. The common five species of include hard fescue, chewing fescue, (blue) sheep fescue, creeping red fescue, and thin creeping red fescue.

2.4.1 Hard Fescue (*Festuca longifolia*)

The bunch-type lawngrass known as hard fescue has a deep root structure and robust, bluish-green leaves. It can grow a low-quality, low-maintenance, dense, somewhat tufted grass. For the purpose of controlling erosion on ditches, banks, and along roadside edges, hard fescue is occasionally planted alone or in grass and grass-legume combinations. 'Aurora', 'Aurora Gold', 'Chariot', 'Discovery', 'Ecostar', 'Heron', 'Rescue 911', 'Scaldis', and 'Warwick' are popular varieties.

2.4.2 Chewing Fescue (*Festuca rubra* subsp. *Comutata*)

A very dense, fine-textured, and erect lawn can be created by chewing fescue. Thin, rigid, and bristle-like are the

characteristics of chewing fescue leaf blades. For acidic and infertile soils, this non-creeping bunch-type lawn grass excels. The variants "Banner -III", "Jamestown-II", "Longfellow-II", "Shadow-II", "Tiffany", and "Windward".

2.4.3 Sheep Fescue (*Festuca rubra*)

This creeping rhizomatous fine fescue has been effective in seed combinations for shady lawns for a number of years. A "common type" that is extensively cultivated in Canada is offered in lower-cost, lower-quality seed mixtures frequently referred to as "Boreal" mixes. 'Auruba', 'Audubon', 'Dawson', 'Fenway', 'Florentine GT', 'Jasper-II', 'Shademaster-II', and 'Silver Lawn' are popular types.

2.5 Kentucky Blue Grass (*Poa pratensis*) (Holman Donn, 2005) ^[31]

This perennial, cool-season grass, which forms sod, is indigenous to Europe. Seed head stems are 45 to 60 cm tall, but when utilised for intensive grazing, they can be decreased to 10 to 15 cm. The seed heads are pyramid-shaped and contain a large number of tiny seeds. Per pound, there are about 2,177,000 seeds. The tips of the 15–30 cm long leaves are boat-shaped (keeled). The leaves are soft and globous. The plant maintains its green tint in the autumn but does not grow throughout the scorching summer. Early in the spring, growth begins. Tiller buds develop into rhizomes or stems. Older rhizomes' nodes can also produce new rhizomes.

Varieties

For mountain regions: Abbey, Able 1, Adelphi, America, Apex, Aspen, Banff, Baron, Blacksburg, Crest, Eclipse, Freedom, Kelley, Liberty, Limousine, Livingston, Merit, Midnight, Nustar, Nublu, Parade, Princeton 104, Ram-I, SR2000, and Victa.

For light to moderately shady lawns: A-34, Alpine, Apex, America, Blacksburg, Bristol, Classic, Freedom, Georgetown, Glade, Limousine, Mystic, Nugget, and Ram-I. The lower maintenance varieties: are Park, Kenblue, and North Dakota Common.

Forage types: Park, Troy, Ginger.

Tolerant to closer mowing: Adelphi, Bristol, Ram I and Touchdown.

Compact Midnight type (Resistant to necrotic spot)

Arcadia, Rugby II, Award, Impact, Midnight, Total Eclipse, Liberator, Quantum Leap, Odyssey, Absolute, NuGlade, Alexa, Midnight II, Ginney, Rambo, Courtyard, Tsunami, Awesome, Freedom II, Beyond, Perfection, Chicago II, Excursion, Barrister.

Compact America type (Resistant to summer patch, leaf spot and powdery mildew)

Showcase, Apollo, SR 2284, Brilliant, SRX 2394, Langara, America, Unique, Boutique, Bluemax, Bedazzle, Avalanche, Glenmont, Arrow, Blue Ridge, Royale, Goldstar, Mallard.

Aggressive type (Very wear tolerant)

SRX 26351, P-104, Northstar, A-34, Mystic, Limousine.

Bellevue type (Resistant to leaf spot and stripe smut)

Parade, Freedom, Bellevue, Dawn, Suffolk, Trenton, Georgetown, Banff, Classic, Haga.

Mid-Atlantic type: SR 2000, Livingston, Monopoly, Bel-21, Preakness, Plush, Eagleton, Wabash. CELA type Challenger, Adelphi, Eclipse, Jefferson, Liberty. BVMG type: Baron, Nassau, Victa, Raven, Merit, Marquis, Gnome, Blue Chip, Dragon, Fortuna, Abbey, Gold rush, Blue Star, Envicta, Baronette, Clearwater, Crest, Cannon.

Shamrock type

SR 2100, Shamrock, Champagne, Parkland, Atlantis. Cherry type: SRX QG245, Cheri, Sydsport, Cobalt, Serene.

λ Julia type: Julia, Caliber, Ikone, SR 27832.

Common types

Kenblue, Huntsville, Geary, Newport, S-21, Park, Piedmont, Alene, Greenley, Ginger, Garfield, South Dakota Cert. Drought tolerance varieties: Skye, Prosperity, Millagro, Armadillo, Mong

Importance and use

Bluegrass may provide a lush, green sod that is particularly well suited for parks and residential lawns. Kentucky bluegrass's vigorous, dense turf-forming behaviour makes it a superior erosion control plant. It can be used to control erosion in regions with heavy use, steep banks, streams, field borders, conservation cover and other grasses or legumes.

2.6 Perennial rye grass (*Lolium perenne*), (Balasko, et al. 1995) ^[32]

Its origins are in Northern Africa, Asia, and Europe. The plant has a tillering growth habit and is a low-growing, tufted, glabrous grass. The upper surface of the leaves has conspicuous parallel veins and serrated parallel sides, and the lower surface is shiny, glabrous, and dark green. The leaves have a strong central keel and are flattened, folded lengthwise in the bud. At the base of the leaf blade, the short ligule is truncate, and tiny white auricles grasp the stem. The base of the leaf sheaths are often glabrous and tinted pink. The 90 cm tall, articulate stems.

The spikelets are edgewise-on to the stem on alternate sides of the branchless inflorescence. Each awnless spikelet has between 4 and 14 florets on a single glume that is located on the side away from the stem. In bloom from May through November, the plant. The fibrous root structure of perennial ryegrass contains large main roots and thinner lateral branches.

Varieties

'Accent', 'Achiever', 'Affirmed', 'Alliance', 'All Star-II', 'Amazing', 'Applaud', 'ASP 400', 'Bright Star-II', 'Caypso-II', 'Catalina', 'Cathedral-II', 'Celebration', 'Champion GQ', 'Chirismatic', 'Churchill', 'Citation-III', 'Cutter', 'Dandy', 'Dimension', 'Divine', 'Elf', 'Elfkin', 'Elite', 'Exacta', 'Fiesta-III', 'Hardstart', 'Jet', 'Kokomo', 'Laredo', 'Majesty', 'Manhattan-4', 'Mardi grass', 'Medalist Gold', 'Night Hawk', 'Pinnacle', 'Pizzazz', 'Pleasure', 'Precision', 'Prelude-III', 'Prizm', 'Promise', 'Protocol', 'Stallion Supreme', 'Stellar', 'Sunshine', 'Top Hat', 'Vivid', 'Wizard'.

Importance and use

It is a superior grass for athletic fields, sod production, and lawns. Except for greens, it is utilised extensively across

golf courses. It is simple to combine with grass seeds. Ryegrass that grows year after year is frequently utilised to stabilise soil and provide rich forages. Typically, diploid variants are best for turf grass and conservation plantings, while tetraploid kinds are useful for forages (Peterson, 2002) [33].

2.7 Rough Blue Grass (*Poa trivialis*), (Edminster, 1992) [34]

Its origins are in Northern Africa, Asia, and Europe. The plant has a tillering growth habit and is a low-growing, tufted, glabrous grass. The upper surface of the leaves has conspicuous parallel veins and serrated parallel sides, and the lower surface is shiny, glabrous, and dark green. The leaves have a strong central keel and are flattened, folded lengthwise in the bud. At the base of the leaf blade, the short ligule is truncate, and tiny white auricles grasp the stem. The base of the leaf sheaths are often glabrous and tinted pink. 90 cm tall and articulate stems are present. The spikelets are edgewise-on to the stem on alternate sides of the branchless inflorescence. Each awn less spikelet has between 4 and 14 florets on a single glume that is located on the side away from the stem. In bloom from May through November.

Importance and uses

It is a superior grass for athletic fields, sod production, and lawns. Except for greens, it is utilised extensively across golf courses. It is simple to combine with grass seeds (Ward and colleagues, 1974) [35]. Ryegrass that grows year after year is frequently utilised to stabilise soil and provide rich forages. Forages typically benefit from tetraploid types, while turf grass and conservation plants benefit from diploid kinds.

2.8 Tall fescue (*Festuca arundinacea*)

Tall fescue is a vigorous, rhizomatous grass with a coarse texture that grows most of its new leaves and tillers from the top. It has a bunch-like growth habit and very weak sod-forming traits. The blades of a leaf are hard and flat. The stems are 90-120 cm tall and carry a panicle that nods and is 10-30 cm long.

Varieties: ‘Max Q’, ‘Texoma Max Q’, ‘Kentucky-31’, ‘Alta’, ‘Goar’, ‘Kenmont’, ‘Fawn’, ‘Kenwell’, ‘Kenhy’, ‘Missouri-96’, ‘Mozark’, ‘

Importance and uses

Fescues are used for streams, pond dams, farm lanes, and lawns in addition to for forages. To produce summer forages, tall fescue can be combined with warm-season forage plants such as native grasses, Bermuda grass, or summer annuals.

2.9 Velvet bent grass (*Agrotis canina*) (Brilman, 2003)

It is a European turf grass with a fine texture and more shoots per square inch. The hue of velvet bentgrass is paler than that of colonial and creeping forms. Rolling vernation, a wide collar, and a pointed membranous ligule identify velvet-bent grass. The turf quality, low maintenance, winter colour, brown patch, vivid, medium green hue, shadow tolerance, and drought tolerant qualities of this grass are top regarded (Boesch and Mitkowski, 2007) [36].

Varieties: ‘Greenwich’, ‘Legendary’, ‘SR 7200’, ‘Venus’, ‘Vesper’, ‘Villa

Importance and use

It has the potential to be used as turf for golf greens and lawns. When compared to creeping bentgrass, velvet bentgrass develops a smoother and more reliable playing surface thanks to its finely textured leaf blade and high shoot density.

2.10 Wheatgrass (*Agropyron spp*), (Asay and Jensen, 1996; Asay et al., 1997) [37, 38]

The most common uses for wheatgrass are as a forage and pasture grass grown for hay and to provide a different kind of lawn. Western wheatgrass grows into a good ground cover for erosion due to its rhizomatic nature. Waterways benefit greatly from the excellent erosion control provided by thick spike wheat grass.

Table 2: The type of Wheatgrasses

Thick spike wheatgrass	SSstreambankwheatgrass	Western wheatgrass	Slender Wheatgrass	Blue bunch Wheatgrass
This indigenous rhizomatous grass can withstand cold and drought very well. It can reach a height of 30 cm in an ideal environment. They are the best species for slopes and extremely exposed areas because of their growth habit, which forms an excellent ground cover. Varieties: ‘Critana’, ‘Bannock’	One of the most widely adaptable and drought-tolerant grasses. Like thick spike wheatgrass for ease of establishment, stream bank wheatgrass is regarded as a native and a good sod former. Varieties: ‘Sodar’	When compared to thick spike or stream bank wheatgrass, this native grass takes a little longer to develop and does not make a dense sod. Contrasting with the characteristic light green of other types of wheatgrasses, western wheatgrass is bluish-green in colour. Varieties: ‘Rosana’, ‘Ariba’, ‘Rodan’, ‘Barton	This cool-season bunchgrass has a limited lifespan and does well on medium-light textured soils. When mixed with other native species that survive longer, it is very simple to grow and provides immediate cover. Varieties: ‘Pryor’, ‘Revenue’, ‘San Luis’.	This cool-season bunchgrass has a long lifespan, is adaptable to a variety of soil types, and is extremely drought tolerant. Varieties: ‘Secar’

3. Method of establishment

1. Planting: Although there are certain grass species that are vegetatively propagated, most grasses. This can also be spread by seeds. Seeding, sodding, plugging, dibbing, turning, plastering, and other techniques are frequently utilised. The many seeding techniques employed range from manual planting to using machinery. Time of sowing, seed

rate, depth, and other aspects of seeding are mostly influenced by the species of grass, its growth pattern, and seed size. For instance, lower seed rates are used when planting grass species with lateral growth through rhizome, stolons, or both.

Transplanting grass, whether it be in large or small pieces, is known as vegetative planting. The entire seedbed is covered

with plants after solid sodding. Spot sodding, plugging, sprigging, or stolonizing all relate to the planting of individual stolons or rhizomes, which are subterranean runners, or small pieces of sod. The majority of warm-season turf grasses are planted as vegetative plant parts to establish them. Centipede grass, carpet grass, common Bermuda grass, and Japanese lawn grass (*Zoysia japonica*), which can be cultivated from seed, are exceptions to this rule.

Although some grass species can be spread through seed as well, grasses are typically propagated vegetatively. Transplanting grass, whether it be in large or small pieces, is known as vegetative planting. The techniques that are frequently utilised include sodding, sprigging, plastering, plugging, sowing, and turning. These lawn establishment techniques are described below.

2. Seedling: "Doob" grass (*Cynodon dactylon*) is the most widely used grass that can be seeded. It develops a mat quickly and roots radially at the nodes. The foliage is thin and dark green with parallel vines. When the availability of pure doob seeds is guaranteed, sowing is advised. Hulling is advised for planting in the spring and summer to promote faster germination, but it is not necessary for planting in the late autumn and winter to postpone germination until more favourable conditions are present in the spring. One hectare of planting requires about 25-30 kilogrammes of seed.

3. Sodding: The vegetative propagation technique of sodding is expensive. When rapid cover is required, such as to prevent. Soil preparation, acquiring high-quality sod, transplanting, and post-planting are all steps in the establishment process for sod. Similar to planting, soil preparation is required for sodding. Getting the sod to take root as quickly as possible in the underlying soil is the main goal of sod transplanting. Proper soil preparation, enough moisture in the underlying soil, and transplanting methods that prevent sod drying are all factors that affect rapid rooting. Use a plank or a piece of plywood to stand or kneel on to protect the newly laid sod. This will disperse the weight over a wider region more equally. The sod should be laid perpendicular to the slope.

After installing the sod, lightly roll it with a roller filled with water before watering it, in two to three weeks, most sod will begin to root. During the rooting process, daily watering could be essential. Never allow the sod to dry out while it is being established. When the daytime temperature is consistently above 90 degrees, avoid laying sod.

4. Sprigging: Stolon's and rhizomes are planted using this technique in small holes and furrows. A grass sprig is a single stem or section of stem that is free of soil attachment. They are spaced out in plantings. The ideal planting period for sprigs is late spring through summer. The plugs should be tamped into place after being inserted firmly into the pre-cut holes on 15 to 30 cm centres. Sprigs can be planted in shallow rows with a spacing of 15 to 30 cm, lightly disced, and covered with soil. Bermuda grass and Zoysia grass both sprout between 7 and 10 bushels per 1000 square feet.

Soil preparation for sprigging should be the same as for the other methods of planting. Sprigs are planted at a depth of 1-2 inches, 4-6 inches apart in the furrows. However, shallow planting can also be practiced provided adequate moisture is

available. and Zoysia grass ranges from 7 to 10 bushels per 1000 square feet.

Another way to sprig is to lay the sprigs end-to-end, spaced approximately 6 inches apart, on the soil surface. Then, using a notched stick or blunt piece of metal, such as a dull shovel, press one end of the sprig into the earth.

5. Stolonizing: Stolonizing is the act of dispersing the turf grass plant's reproductive structure, or stolon, over the soil's surface in a manner similar to seeding. Stoloniferous grasses are the only form of grasses that may be propagated in this manner. Bermuda grass and bent grass are the two most prevalent stoloniferous grasses. The method is significantly more expensive than seeding, it can result in a very uniform turf that is all of the same genetic type. It is generally not advised because this could potentially be very terrible if a specific disease affects that particular cultivar of grass.

6. Plugging: Plugging is the practice of placing blocks of sod with a diameter of 2 to 4 inches at regular intervals. When compared to sprigging, plugging requires three to ten times as much planting material. The three types of turfgrass that are most frequently started from plugs are centipede grass, zoysia grass, and St. Augustine grass. These plugs are inserted into the prepared soil at intervals of 6 to 12 inches. The sod will cover more quickly the closer the plugs are planted together. However, the more sod it takes to produce enough plugs to cover the lawn area, the closer the plugs must be planted together. Closing the planting of plugs is indicated for speedy lawn establishment. An online-hundred are foot piece of sod can cover one thousand square feet of plugs. Any grass type that spreads can theoretically be used for plugging but with the time it takes to get fully established

7. Dibbling: This approach is the quickest but takes the most time. When the ground is level and wet from rain, small portions of grass roots should be dipped 10 to 15 cm apart. Through regular mowing, rolling, and watering, the roots spread and grow underground over the period of six months, creating a pretty compact lawn.

8. Hydromulching: Although hydromulching is still relatively new, it is becoming utilised more frequently. Hydroseeding and hydro-mulching are also common names for this method. This procedure involves spraying the desired area with a mixture of the desired grass seed, virgin wood mulch, and water. Although the technique is fairly pricey, it is typically less expensive than sodding. During hydro-seeding, seed is dispersed evenly over a sizable region using a high-pressure hose.

To keep seed moist and in place, it is combined with a substance like mulch. For big lawns, places with steep slopes, or hard-to-reach areas, hydroseeding is an excellent option. Hiring a specialist is necessary for hydroseeding. Compared to traditional seeding techniques, hydroseeding uses less watering and creates a stand that is more consistent. However, planting costs are slightly larger than those of conventional techniques.

9. Astro Turf: The first version of AstroTurf, which was created by Monsanto in 1965, was a short-pile synthetic turf used for sporting fields, patios, and other surfaces. It was constructed of vinyl and nylon to mimic turf. It is a type of artificial lawn that is frequently used in play areas and roof gardens in developed nations. It eliminates the typical

upkeep that is often needed for typical lawns. One of the main requirements to bind the synthetic fibre and create a surface resembling a turf carpet is constant watering.

Despite being lovely, a large lawn can get boring quickly. Therefore, it is advised to plant a stunning tree or shrub as a single specimen in the grass to break up the monotony.

Activities/month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Seedling planting												
Gap filling												
Seedling												
Fertilization												
Liming												
Dethatching												
Aeration												
Weed management												
Root grub control												
Chinch bug control												
Sodwebb worm control												

Fig 1: Indian Lawn management calendar

4. Conclusion

In view of the findings in the present study, descriptions of many turf grass species, which we can choose on the basis of any area and condition. Species/varieties be selected and lawns can be installed using suitable methods. A grass blend of fine-leaved bents and fescues is utilised in the cold season, for example, *Agrostis tenuis* and *Festuca rubra*. The best lawns are produced during the warm season by cultivars of *Zoysia* and ordinary Bermuda grass. Moreover, because there are several species of grass, it is a good idea to take the climate into account while choosing the grass for a lawn as well as variants for various climates. In humid climates, it is advisable to choose a grass that can endure these tenacious assaults, and wood meadow grass blended with rough-stalked meadow grass for the best coverage and beauty. In warm regions, *Cynodon dactylon* is utilised, whereas *Festuca rubra* var. *rubra* and *Paspalum notatum* (Bahia grass), *Axonopus* (carpet grass), and *Agrostis tenuis* are employed in cool climates. Similar to high-quality lawns, sports fields are made up of a blend of bent grass and fescue. But again, it is a good idea to consider adding perennial ryegrass to the mix to add that aspect of protection when playing games like tennis, for instance. Bermuda grasses are also a great location to start because they offer a resilient, beautiful surface that serves as the greatest covering. For establishment of lawns also depends upon the method we can choose which one is better for establishment. Doob" grass (*Cynodon dactylon*) is the most widely used grass that can be seeded and in the priggig method.

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