A Simplified Turfgrass Height-measuring Device

Richard L. Parish[1],
Edward W. Bush[2], and
Dennis P. Shepard[3]

Additional index words. disc meter, disk meter

Summary. A simplified design for measuring the height of turfgrass (or forage) was developed and used by the Louisiana Agricultural Experiment Station (LAES). The device is similar to the common "disc meter" devices used for turfgrass and forage height measurement, but it uses a constant-force spring to simplify construction and operation. Use-of a constant-force spring allows a steady operating force on the sliding member of the device and eliminates the need for machining slots, thus greatly simplifying construction and reducing cost. The simplified device has worked well in the turfgrass research program of the LAES.

Turfgrass research frequently requires repetitive measurements of turf height or seedhead height. Individual measurements using tape measures or similar devices are slow and tiresome to make, and frequently are not representative of the overall turf height. A device known as a "disc meter" was developed my forage agronomists (Bransby et al., 1977; Sharrow, 1984) and has been used in turfgrass research. The disc meter consists of a flat disc of clear plastic mounted horizontally at the bottom of a vertical PVC pipe that is free to slide vertically on a smaller PVC pipe. In use, the disc meter is lowered until the plastic disc touches the turf or seedheads with the inner pipe resting on the ground. The turf height is then determined by the location of the sliding pipe on a scale mounted to the inner stationary pipe.

The original design (Bransby et al., 1977; Sharrow, 1984) did not have a spring or springs to help carry the weight of the sliding components. Subsequent versions built by other researchers used coil springs to hold the sliding pipe and plastic disc in the "up" position. Coil springs reduce operator fatigue considerably, but still present two problems. First, coil springs follow Hooke's Law, which states that the spring force increases linearly with extension, as determined by the spring constant. For a device 6 ft (2 m) long with a 3-ft (l-m) stroke, the change in spring force is inherently very drastic; thus, significant force is still required at one end of the stroke. Second, mounting one or more coil springs is complicated. If the spring(s) are internal, a slot must be milled in one of the pipes, thus raising the cost considerably and also weakening the pipe. If the spring(s) are external, the device becomes very awkward to handle and potentially dangerous.

A simpler design with uniform force was needed for extensive turfgrass height measurements in research work at the LAES.

Materials and methods

A simplified disc meter for turfgrass research was constructed by the LAES. The design is shown in use in Fig. 1. The device used 74 inches (1.88) m) of nominal 2-inch (51-mm) PVC pipe for the stationary pipe and 36 inches (0.91 m) of nominal 2.5-inch (63.5 -mm PVC pipe for the vertically moving pipe. A 12-inch (305-mm) -diameter disc of 0.25-inch (6.4-mm)- clear acrylic plastic was glued to the bottom of the moving pipe. A hole matching the outside diameter of the 2.5-inch outer pipe was cut into the clear acrylic and the acrylic was glued to the outer pipe using PVC glue. The stationary pipe was first marked at 1-inch (25.4-mm) increments in such a way that the top of the moving pipe was at zero when the disc was resting

Fig. 1. *Disc meter in use measuring unmowed turfgrass.*

Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Baton Rouge, LA 70803.

[1]*Professor. Biological and Agricultural Engineering Dept.*

[2]*Instructor, Horticulture Dept.*

[3]*Assistant Professor, Horticulture Dept.*

Approved for publication by the Director of the Louisiana Agricultural Experiment Station as manuscript number 93-07-7328. Use of trade names does not imply endorsement of products named by the Louisiana Agricultural Experiment Station nor criticism of Similar ones not named. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked advertisement solely to indicate this fact.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-08-31 via free access

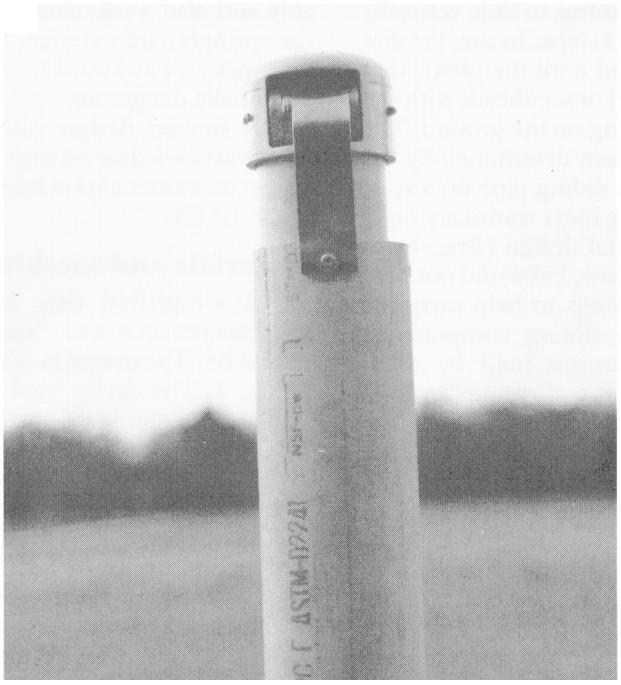

Fig. 2. ***Detail of constant- force spring mounted on disc meter.***

Fig. 3. ***Constant-force spring extended as measuring disc is lowered.***

on the ground (without turf). The original markings were made with a felt-tipped marker. A steel tape with marks at 0.25 -inch increments was later added.

Amass of the moving components was counterbalanced by a single constant-force spring (Associated Spring, Dallas, Texas, Model CF043-0700), as shown in Figs. 2 and 3. A constant-force spring is similar to the tape insert in a metal tape measure; i.e., it consists of a strip of spring steel that is rolled into a helix. When the helix is restrained linearly, but allowed to rotate and the end unwound into a straight strip, the linear force on the Strip is essentially constant throughout the stroke. The spring used for this application had a nominal force of 7 lb (31 N) and a working extension of 33 inches (0.84 m). The spring helix was mounted on a pivot shaft in a PVC pipe cap fastened to the top of the stationary pipe, with the extension end fastened to the side of the moving pipe. No milled slots were needed in the pipes. There was no provision for locking the device in a particular setting.

Results and discussion

The simplified disc meter has been used extensively by LAES horticulturists to measure turfgrass and seedhead height in turfgrass research plots. Its performance was compared to older, less-convenient disc meters. It was found to give equivalent readings with less effort. It provided accurate measurements with substantially less fatigue than is associated with non-spring disc meters or disc meters with typical coil springs. Field workers liked using the device, and the professional horticulturists involved were quite satisfied with the accuracy and repeatability. It was much easier to build and the resulting unit was stronger than typical disc meters using coil springs operating in milled slots.

Literature Cited

Bransby, D.I., A.G. Matches, and G.F. Krause. 1977. Disk meter for rapid estimation of herbage yield in grazing trials. Agron. J. 69:393-396.

Sharrow, S.H. 1984. A simple disc meter for measurement of pasture height and forage bulk. J. Range Mgt. 37(1):94-95.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-08-31 via free access