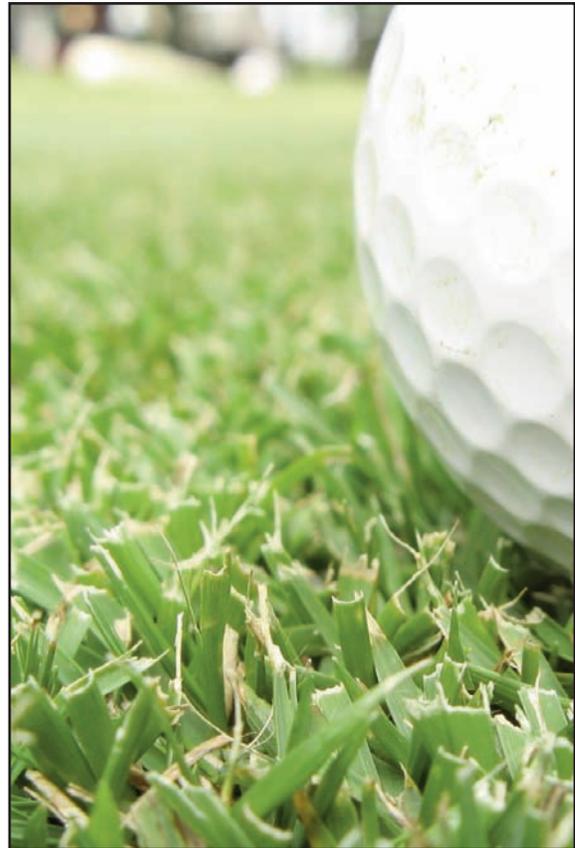


Golf Ball Lie Differs Among Bermudagrass, Zoysiagrass, and Their Cultivars

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Golf ball lie in Meyer zoysiagrass

Photo by Aaron Patton

Summary. The place at which a golf ball comes to rest in the canopy can have a dramatic effect on how a player will attempt the next shot. Although turfgrass species and cultivars are continuously being evaluated to improve playing conditions on golf courses, very little research has evaluated golf ball lie in fairways, especially with respect to bermudagrass and zoysiagrass. A recently developed technique for quantifying golf ball lie using digital image analysis effectively distinguishes differences in ball lie of varying turf canopies. The objective of this study is to quantify differences in the percent of ball exposed under fairway conditions using digital image analysis for two bermudagrass and zoysiagrass species and their cultivars. Across a total of five collec-

tion dates in this study, bermudagrass cultivars had a greater percent of the ball exposed, or improved ball lie, than zoysiagrass cultivars. Those cultivars with the best ball lie include Cavalier zoysiagrass, Patriot, Princess-77, Tifsport, and Tifway bermudagrass. The cultivars Palisades zoysiagrass and Riviera bermudagrass both had poor ball lie on several different dates in the study. This research will allow superintendents to select cultivars or species to meet the needs of their players and the difficulty of the playing conditions on the course.

Abbreviations: ZJ, *Zoysia japonica*; ZM, *Zoysia matrella*; CD, *Cynodon dactylon*; CDT, *Cynodon dactylon* × *C. transvaalensis*; C, *Cynodon* spp.; Z, *Zoysia* spp

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The position at which a golf ball comes to rest in a turf canopy greatly influences how a player will attempt their next shot. Bermudagrass (*Cynodon* spp.) and zoysiagrass (*Zoysia* spp.) are the two most commonly used turfgrasses for golf course fairways in Arkansas. Determining which cultivars of these species have the best ball lie will ultimately allow superintendents to improve playing conditions on golf courses. Researchers at the University of Arkansas recently developed a method to measure golf ball lie (Richardson et al., 2008). Zoysiagrass has been attributed to providing a good golf ball lie for players to make their shot (Bevard, 2005; Hurley, 1976). The more rigid leaves and dense canopy of zoysiagrass provides a favorable surface to support a golf ball higher from the ground (Erusha et al., 1997). Cella et al. (2005) investigated the effect of leaf angle, thatch depth, and tiller density on ball lie in Kentucky Bluegrass and found that better ball lie was more correlated with tiller density.

Although zoysiagrass has been attributed with having a good ball lie, there have been no studies that directly compare bermudagrass and zoysiagrass for ball lie under fairway conditions. Also, knowing how ball lie characteristics for various cultivars and species is affected by differing mowing frequencies may provide better information for golf courses with differing budgets and maintenance capabilities. The objective of this research is to quantify differences in the percent of ball exposed for two bermudagrass and zoysiagrass species and their cultivars.

Materials and Methods

Five cultivars of bermudagrass and seven cultivars of zoysiagrass were established in the summer of 2007 (Table 1). Plots were maintained under golf course fairway conditions, with a mowing height of 0.5 inches and monthly applications of 1.0 lb N/1000 ft² for bermudagrass and 0.5 lb N/1000 ft² for zoysiagrass during the growing season. Golf ball lie on each cultivar was measured on two dates immediately after mowing, and on three dates on plots that were not mown for four days. Three golf balls were randomly rolled

onto each plot and the depth that the ball came to rest in the canopy was measured using a device developed at the University of Arkansas (Richardson et al., 2008). Each golf ball was considered a subsample and the three subsamples were averaged for each plot on each sampling date.

Results and Discussion

Differences in ball lie existed between species and among cultivars. In three of the five sampling dates, bermudagrass cultivars had a better ball lie than zoysiagrass cultivars (Table 1). This is significant when correlated with anecdotal observations of both professional and amateur players and reports in professional publications, in which zoysiagrass is attributed with having a good ball lie. These anecdotal observations may be due in part to *Zoysia* spp. having more rigid leaves that originate from lower on the stem of the plant when compared to bermudagrass. This particular growth habit of zoysiagrass may cause the ball to sit lower with respect to the turfgrass plants, and thus have less percent of ball exposed. This growth habit may result in zoysiagrass having less percent ball exposed, even though the ball may be elevated above the soil surface and still providing an adequate ball lie. Other factors such as tiller density (Cella, 2005) may affect ball lie within or across species and thus need to be evaluated.

Of those bermudagrass cultivars, Patriot, Princess-77, TifSport, and Tifway all had superior ball lie in the four sampling dates where differences occurred. Cavalier was the only zoysiagrass cultivar that was in the highest statistical category for the four dates in which significant differences occurred. Palisades had the lowest ball lie measurements for three of the four dates in which significant differences occurred. Riviera, the only common bermudagrass (*Cynodon dactylon*) cultivar in the study, was in the lowest statistical category for ball lie in two sampling dates, possibly indicating that common bermudagrass cultivars may produce inferior ball lies compared to hybrid bermudagrass (*C. dactylon* × *C. transvaalensis*).

Of those significant differences that existed between species and among cultivars, most were between a 1 and 6% difference in percent of ball exposed; however, the unmown plots for August 28 had much larger differences. Although no direct comparison was made, ball lie was poorer in unmown turf and the range in ball exposed across cultivars was larger in unmown vs. mown turf. Even though differences existed for percent ball exposed, the impact of these differences on a player's shot is unclear. More research is needed to correlate the percent of ball exposed to the difficulty of a golf shot. This research will allow superintendents to select cultivars or species to meet the needs of their players and the difficulty of the playing conditions on the course.

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Table 1. Ball lie, expressed as percent of ball exposed for various cultivars of bermudagrass and zoysiagrass across five dates.

Cultivar	Species	Ball Lie ^z				
		Mown		Unmown		
		28 Aug.	24 Sep.	7 Jul.	28 Aug.	24 Sep.
		-----%-----				
Cavalier	ZM ^y	95.4	95.5 abc ^x	88.5 ab	85.5 abc	88.5 a
Diamond	ZM	96.5	94.5 bc	91.3 a	88.1 ab	89.9 a
El Toro	ZJ	96.6	95.6 abc	89.3 ab	88.1 bcd	85.1 a
Meyer	ZJ	96.7	94.7 abc	86.7 b	86.8 abc	84.5 a
Palisades	ZJ	95.3	93.3 c	88.7 ab	75.7 d	73.1 b
Patriot	CDT	95.7	97.0 a	89.3 ab	91.1 a	90.8 a
Princess-77	CDT	95.9	95.7 abc	90.2 ab	84.8 abc	90.1 a
Riviera	CD	96.2	94.4 bc	87.5 b	88.6 ab	90.3 a
Tifsport	CDT	96.6	96.2 ab	90.2 ab	88.2 ab	91.0 a
Tifway	CDT	97.7	96.2 ab	90.4 ab	91.9 a	88.4 a
Zenith	ZJ	95.8	94.8 abc	88.7 ab	80.3 cd	83.9 a
Zorro	ZM	96.7	95.7 abc	87.8 ab	82.0 bcd	84.5 a
mean		96.3	95.3	89.1	85.4	86.7
<i>Species</i>						
Bermuda	C	96.4	95.9 a	89.5	88.9 a	90.1 a
Zoysia	Z	96.1	94.9 b	88.7	82.9 b	84.2 b

^z Ball lie expressed as percent ball exposed.

^y ZJ = *Zoysia japonica*; ZM = *Zoysia matrella*; CD = *Cynodon dactylon*; CDT = *Cynodon dactylon* × *C. transvaalensis*; C = *Cynodon* spp.; Z = *Zoysia* spp.

^x Cultivars within the same column are not significantly different.