was detected between the least and most tolerant biotypes. The most heat tolerant biotype in this study was sampled from Avon CC, Cleveland, Ohio and the least from Douglasville, Georgia. No correlation between location and tolerance was found. High temperature treated biotypes were more prone to drought stress than non-treated. It was interesting to note that the experiment was repeatable during the summer months but no difference in heat tolerance was detected among biotypes when screened during the fall [October].

An interesting observation was made that may explain why annual bluegrass is sensitive to drought and pest stresses. When we subjected biotypes to heat treatments, followed by a two-week recovery period, the heat treated biotypes that survived appeared visually the same as the non-treated biotypes [controls]. However, if these biotypes were subjected to a minor moisture stress [a level at which no visual affect was observed on the controls], the heat treated biotypes died. From this observation it appears that heat predisposes annual bluegrass to moisture stress. Further, work is needed to quantify this observation. It may help explain the sensitivity of annual bluegrass to summer diseases such as anthracnose that are caused by relatively weak pathogens. This is conjecture but it does bring up the possibility of future research.

The two biotypes from Avon, Cleveland and Douglasville, Georgia along with "Victa" Kentucky bluegrass and a tall fescue cultivar are being propagated in suspension culture. This plant material will be used to determine if and in what quantity heat shock proteins [HSP] are formed. These proteins will be evaluated for feasibility and practicality as a rapid screening method of determining high temperature tolerance in turfgrass genetic material.

This work will be successful and completed by the summer of 1987. At this time, the use of HSP for determining heat tolerance in breeding programs is still feasible. Preliminary work at Cornell University has shown differences among corn hybrids with regard to HSP formation. It may turn out to be a method for "finger printing" turfgrass cultivars. The project is progressing well and will hopefully yield information important to the turfgrass community.

OKLAHOMA STATE UNIVERSITY - Dr. A. D. Brede
Principal Investigator

Breeding and Evaluation of
Cold Tolerant Bermudagrasses

1986 Grant - $20,000 [first year of support]

Presently there is no cold-tolerant, seed-propogated, fine-textured turf bermudagrass variety available for use in the northern half of the bermudagrass belt. The basic objective of research jointly

sponsored by the United States Golf Association and the Oklahoma Agricultural Experiment Station is the development of such varieties.

To-date, we have identified cold-tolerant bermudagrass plants with good fertility, incorporated them into breeding populations [germplasm pools], and completed two cycles of selection for increased basic fertility and growth characters. Significant response to selection has been documented. An additional cycle of selection will begin next spring.

Significant progress was made in recent months in tissue culture research with bermudagrass. Plants have been regenerated from very young inflorescence explants, and work underway with other explant tissues, including anthers, appears promising. Regeneration of plants from anthers would provide opportunity for development of haploid plants [plants containing half the normal chromosome number] which have several potentially significant benefits to breeding.

Preliminary research was initiated recently to characterize the self-incompatibility mechanism in bermudagrass. Bermudagrass plants typically are strongly self-incompatible, thus will not produce seed when self-pollinated. Although we know the mechanism exists, very little is known about how it works or about its genetic control.

Development of a reliable laboratory technique for measuring cold tolerance in bermudagrass would be of immense value in screening plants for the bermudagrass breeding program. The necessary equipment has been obtained and Dr. Jeff Anderson, stress physiologist in the Department of Horticulture and Landscape Architecture, has initiated experiments to develop the procedures. Development of a laboratory procedure would enable cold hardiness determinations without relying on the occurrence of test winters.

PENNSYLVANIA STATE UNIVERSITY - Dr. Joseph M. Duich
Principal Investigaror

Bentgrass Breeding

1986 Grant - $4000 [ongoing support since 1958]

I. Creeping Bentgrass

A. PENNLINKS creeping bentgrass [experimental designation PSU-126] was released and named by the Pennsylvania Agricultural Experiment Station Seed Committee on November 3, 1986. Application was made for Plant Variety Protection. Varietal features are upright growth habit, finer leaves than current varieties, minimal segregation after 8 years, seasonal turf quality and overall performance in a 17 state plus Canada evaluation. Limited quantities of seed are now commercially available.