Variation in Flowering and Germination in Hilaria belangeri

A. E. Ralowicz, C. F. Mancino and D. M. Kopec

INTRODUCTION

Recent water use legislation in Arizona has forced facilities with 10 acres or more of turf to reduce the quantity of water used for irrigation. The use of Hilaria belangeri, curly mesquitegrass, a potential desert turfgrass, may ease the impact of these water restrictions. This grass is capable of survival and reproduction on 30 cm of rainfall per year under range conditions.

Experiments have been conducted on plant materials collected in the southern half of Arizona. An understanding of flowering biology is essential for crop improvement through conventional plant breeding techniques. Germination experiments estimate the genetic variation in germinability and assess the ability of this grass to be established from seed on a commercial level.

MATERIALS AND METHODS

Flowering

One hundred spikes were randomly selected and tagged in a greenhouse on the University of Arizona main campus. Each spike was monitored through the pistillate and staminate flowering phases. Stigmas were left intact on spikes while anthers were removed after being counted. Irrigations and fertilizations were applied uniformly over all plant material. Data were collected on: (a) number of spikelets per spike; (b) number of stigma pairs per spike; (c) duration of stigma emergence; (d) the period separating pistillate and staminate flowering; (e) the number of anthers per spike; and (f) the duration of anther emergence and pollen dehiscence.

Germination

Matured inflorescences were collected from 12 range locations in Arizona between 9/2/87 and 10/11/87. Spikes were stored at room temperature in paper bags. Spikelets were removed from the rachises, and caryopses were separated from spikelets. All seed lots were cleaned with a Dakota blower.

Treatments followed guidelines of the AOSA (AOSA 1981. Journal of Seed Technology, 1-126.). A randomized complete block design with 3 blocks and 3 treatments, consisting of: 1) distilled de-ionized water (control); 2) gibberellic acid (500 ppm); and potassium nitrate (2000 ppm) with 12 seed lots were used for this experiment. Germination paper was placed into each petri dish. Petri dishes received 6 ml of treatment solution. Twenty seeds were placed in each petri dish. Petri dishes were placed in a germination chamber without light set at 36^{o} C and 23^{o} C for 12 hr, respectively. Appropriate treatment solutions (3 ml) were re-administered to all petri dishes after 48 hr to prevent dessication. Germination data were collected 24, 48, 72 and 96 hr after experiment initiation.

RESULTS AND DISCUSSION

Flowering

Spikes on curly mesquitegrass are protogynous; stigma emergence elapsed 5.5 $\pm$ 1.7 days. Spikelet number per spike averaged 6.9 $\pm$ 1.9, and the number of stigma pairs per spike averaged 6.4 $\pm$ 1.9, indicating 7 percent female sterility. The mean period separating the flowering phases was 6.4 $\pm$ 2.6 days. Ten percent of the spikes had receptive stigmas present at the onset of the staminate flowering phase which lasted 9.6 $\pm$ 4.0 days. The average number of anthers per spike was 60.7 $\pm$ 32.5. Nineteen percent of the spikes observed failed to mature beyond the boot stage. Significant differences at the $P=0.05$ level existed between plant selections with respect to spikelet number per spike, stigma number per spike and the period between the two flowering phases. Spikelet number per spike and stigma number per spike appeared to be related to the length of time the plant material was grown in the greenhouse, while the period separating the flowering phases was not related to the length of time in the greenhouse.

Germination

After 24 hr, seed germination was 11.9 percent; after 48 hr, germination was 28.6 percent. Of the seed that germinated, 38.3 of the germination occured after 24 hr, and 91.9 percent after 48 hr. Germination across all treatments ranged from less than one percent to 64 percent. Percent germination averaged 29.6 for the control, 37.9 for the gibberellic acid (500 ppm) treatment, and 26.0 for potassium nitrate (2000 ppm). Germination was significantly increased ($P=0.01$) by gibberellic acid, but no differences existed between the potassium nitrate and the control treatments. Significant differences in germination at the $P=0.01$ level were observed between plant selections, suggesting a genetic influence on germination. These genetic differences indicate that improvements in germinability may be realized through conventional plant breeding and selection techniques.

FUTURE OUTLOOK

Germination data of range collected seed will be compared with germination data from nursery produced seed from the same plant materials. In addition, experiments will be performed with differing concentrations of gibberellic acid in an effort to find the optimum level for germination enhancement. Furthermore, gel electrophoresis will be used to determine the frequencies of self and cross pollinations in Hilaria belangeri.