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RESPONSE OF HEIGHT GENOTYPES OF SORGHUM (SORGHUM BICOLOR (L) MOENCH) TO DIFFERENT DAY LENGTHS[1]

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Abstract : The response of height genotype of sorghum to different day lengths was studied in the University of Wisconsin Biotron.Two day length chambers were used to represent a tropical climate and a temperate climate, which had 12-hour day length and 15-hour day length, respectively. Eight genotypes of sorghum were used in this study. The heights of sorghum genotypes were significantly affected by photoperiod at 30 days after planting. There also were differnces in plant height at the flowering date due to the effect of genotypes and day length. The highly significant difference in day length reponse of plant height showed that with increased day length there was a corresponding increase in plant height. At the longer day (15 hours), more vegetative growth occured.The heights of 1 – dwarf, 2 – dwarf, and 3 – dwarf hybrid milos were taller than the average of their parents in both day length chambers. There were differences in days to flower ascribed to genotypes and day lengths. There was a corresponding increase in days to flower and in plant height with increased day length. At both day lengths all milo hybrids (1–dwf, 2–dwf, 3–dwf) flowered earlier than their respective parents. In addition to the biotron study, the field trial was conducted at the Arlington Experimental Farm using 24 sorghum genotypes. The field trial revealed that by using one parent of the 4–dwf class, the plant height can be reduced. The yield of 24 sorghum genotypes varied widely from 2 144 kg to 5 672 kg per hectare for C–43 y^+ and NK 233, respectifely. All genotypes, except SM 100, grown in the controlled environment chamber flowered in less time than those grown in the field. One - dwarf and 3 - dwarf milo hybrids took significantly longer to flower than their respective parents, which was in contrast with that observed in the Biotron.

INTRODUCTION

Early photoperiod studies by Garner and Allard in 1923 indicated that sorghum (*Sorghum bicolor* (L.) Moench) is a short day plant (5). Although sorghum is of tropical origin, many present day sorghum varieties are well adapted to temperate regions.

Photoperiod and temperature are among the factors which strongly influence the pattern of development and eventual crop yield. The modification of length of day usually results in alteration of floral response and morphology. Various experiments have been done to explain adaptation of plants as influenced by photoperiod and temperature. Many workers have evaluated plant height with regard to crop yields of short and tall plants.

Quinby and Karper (11) made the most comprehensive study of the inheritance of height in sorghum. They concluded that four inherited genes, plus a modifying complex, influenced height, with the alleles for tallness being partially dominant. The recessive alleles of each of the 4 genes had essentially the same effect in reducing height. The genes were designated Dw_1, Dw_2, Dw_3, and Dw_4.

Quinby and Karper (12) suggested the use of 1-dwarf, 2-dwarf, 3-dwarf, and 4-dwarf to designate, respectively, the genotypes that were recessive for 1 gene, 2 genes, 3 genes, and 4 genes.

The objectives of this experiment were to study :

(1) The effect of photoperiodic response on height genotypes of sorghum;
(2) the effect of photoperiodic response on plant maturity and
(3) the yield of different height genotypes of sorghum as measured in a field experiment.

Two experiment were conducted, one in the Biotron and the other at the Arlington Experimental Farm of the University of Wisconsin.

MATERIALS AND METHODS

Biotron.

The response of height genotypes of sorghum to different day length was studied in the Biotron. Eight genotypes of sorghum were used in this study and they are as follows : CKA 4–dwf (female), SM100 milo, WSM100 milo, SA1170 milo, CKA 4–dwf x SM100 (3–dwf milo) CKA 4–dwf x WSM100 (2–dwf milo), CKA 4–dwf x SA1170 (1–dwf milo) and P894 (commercial hybrid). Those genotypes were obtained from J. Roy Quinby of Pioneer Hi-Bred International, Inc.

Two day chambers were used to represent a tropical climate and a temperate climate, which has 12-hours and 15-hours day lengths, respectively. The light intensity was 36,584 lux and consisted of flurescent and incandescent light. The temperature of both chambers varied from 24 to 30°C.

Plants were grown in pots containing vermiculite and peat moss with Hoagland nutrient solution. The latter was applied each day, with up to 2 520 mls added in one day. The solution contained 2 100 mls of mineral nutrient and 420 mls of water. The genotypes were seeded at the rate of six seeds to a pot, and after seven days, each pot was thinned to two plants per pot. There were 48 experimental units and two plants per pot for each of the two day length chambers.

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