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EFFECT OF DELAYED THINNING ON SORGHUM GROWTH AND YIELD[1]

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ABSTRACT

An experiment was conducted to determine if a delay in thinning would adversely affect growth and yield of grain sorghum [*Sorghum bicolor* (L.) Moench]. Results showed that thinning should be performed as early as possible, preferably before plants reach 7.5 cm in height. Yield was reduced when thinning was delayed until plants were 15.0 cm to 23.0 cm in height. Stem diameter was reduced and seed size was increased when thinning was delayed until the plants had reached a height of over 31 cm. We suggest that when a delay in time of thinning is anticipated, planting to a desired population based on reliable laboratory germination tests may be preferable.

Additional index words: Lodging, Plant population.

A COMMON practice in field experimentation with sorghum [*Sorghum bicolor* (L.) Moench] is to overplant and then thin to the desired plant density. The assumption is made that this practice does not alter growth or yield adversely and valid inferences can be extended to natural conditions. Thinning is usually performed immediately after emergence (4), but may be performed at later stages of growth (1, 5). It is probable that under certain circumstances, such as adverse weather conditions or extremely large experiments, research plots would not be thinned until the plants were as tall or taller than 23 cm. Early eliminatian of weed competition is required to prevent yield reduction as well as to prevent adverse changes in other factors or components of yield (2). Therefore, we would expect within-row plant competition to be expressed similarly if thinning treatments were applied at different growth stages. Because our research program involves a large number of experiments and because exact time schedules for thinning are difficult, this experiment was designed to obtain information on the effect of thinning date on yield, certain components of yield, and some agronomic attributes of yield for two sorghum hybrids.

MATERIALS AND METHODS

Sorghum hybrids 'NB 505' (early maturity) and 'RS 626' (medium maturity) were planted in a completely randomized block design with four replications of each treatment. The plots were four rows of 0.61-m spacing. The seedbed was in excellent condition with regard to moisture and texture, resulting in uniform germination and emergence on all plots. The control treatment was planted to a desired population of 300,000 plants/ha based on preliminary germination trials. A stand count showed an average of 282,500 plants/ha for both hybrids. Other treatment plots were planted at three times the desired population and thinned to 282,500 plants/ha at successive growth stages. Sorghum plants were thinned at 2.5 to 7.5 cm height, at 15.0 to 23.0 cm height, and above 31-cm height, 2, 3 and 4 weeks after emergence, respectively. Weeds were controlled with a preemergent application of 0.9 kg/ha of 2-chloro-4-(ethylamino)-6-(isopropylamino)-5-triazine (atrazine) plus 2.6 kg/ha of 2-chloro-*N*-isopropylacetanilide (propachlor). The experiment was irrigated by furrow irrigation throughout the season. Sorghum yield was expressed on a 14% moisture basis from measured lengths of the inside two rows. Stem diameter was measured at the internode of the sixth leaf down from the flag leaf. Seed weight was grams per 1000 seeds. Head length and plant height in centimeters was taken as the average of 10 consecutive plants within a row. Days to 50% flowering was the number of days from planting until 50% of the plants had begun to shed pollen. Analysis of variance was computed on the experimental results and significant differences (5% level) among treatments were tested with Duncan's New Multiple Range Test.

Table 1. Effect of thinning NB 505 and RS 626 hybrid grain sorghums on their yield or components of yield.

	Yield, kg/ha	Seed weight, g/1,000	Head length, cm	Stem diameter, mm	Plant height, cm	Days to 50% flowering
Hybrid (average over treatments):						
NB 505	6,100 b	18 b	20 a	14 b	122 a	64 b*
RS 626	8,380 a	23 a	20 a	16 a	114 b	70 a
Thinning treatment (average over hybrids):						
Control	7,680 a	20 b	20 a	16 a	119 a	67 b
2.5 – 7.5 cm	7,680 a	20 b	21 a	16 a	118 a	69 a
15.0 – 23.0 cm	6,850 b	20 b	20 a	15 a	115 a	66 b
>31.0 cm	6,760 c	22 a	20 a	14 b	122 a	67 ab

* Numbers within a column followed by the same letter do not differ significantly at the 5% level using Duncan's new multiple range test.

RESULTS AND DISCUSSION

The difference between hybrids was highly significant for all parameters except head length (Table 1). Yield was not reduced by delaying thinning until plants were 15.0 to 23.0 cm in height. Similar reductions in yield have been observed for corn thinned at later stages of growth (3). Seed weight significantly increased as a result of delaying thinning until plants were above 31.0 cm in height. The fact that there was a trend toward larger seed for this thinning treatment indicated that the delay affected some aspect of the flowering process. An increase in seed size generally reflects a lower number of seeds per head. This lower seed number most likely accounted for much of the yield reduction that occurred. Head length was not affected by delaying thinning. A significant reduction in stem diameter occurred as a result of delaying thinning until plants were above 31.0 cm in height.

Most of the changes that occurred due to a delay in thinning are typical of plants growing at high populations. For example, sorghum grown at a population of 550,000 plants/ha in comparison to 23,000 plants/ha showed a reduction in seeds per plant and stem diameter. Plant height tended to increase, but was generally affected less than other variables (L. D. Schulze, 1971. The effect of plant population on sorghum [*Sorghum bicolor* (L.) Moench]. M.S. thesis, University of Nebraska, Lincoln.). This was substantiated in the present experiment, where plant height was variable over treatments, but not significantly altered (Table 1). Although the effect of thinning resulted in significant differences in days to 50% flowering, no definite trend was observed.

We can conclude from these results that thinning should be performed as early as possible, preferably before plants are 7.5 cm in height. A delay in time of thinning might result in undesirable alteration of growth and yield. We observed that plants were more prone to lodging if thinned after 23.0 cm in height. This was probably due in part to decreased stem diameter, loosening of the soil around the roots, and perhaps even physical damage to roots that anchored

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adjacent plants. Where experiments are extremely large or if delayed thinning is anticipated, then planting to a desired population based on laboratory germination tests might be a more preferable practice. Highly significant correlations can be obtained between laboratory germination tests and actual field emergence of sorghum (J. T. Feather, 1960. The effects of cold testing techniques on germination and seedling vigor of sorghum seed and the relationship of laboratory germinations to field emergence. M.S. thesis, University of Nebraska, Lincoln).

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