

Effect of Atmospheric Carbon Dioxide
on Growth and Development of Sorghum Plants

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This experiment was conducted in a closed plastic greenhouse, 14.3 by 13.7 meters. Plastic dividers separated the greenhouse into three equal compartments, each with an independently packed column heat exchange system to circulate air.

Carbon dioxide concentrations of 300, 1200, and 2400 ppm were maintained in the center, west, an east compartments, respectively. A Beckman Model 215 infrared CO₂ gas analyzer was used to measure CO₂ concentration.

Wooden flats (91 x 91 x 30.5 cm), similar in construction to those used in the previous experiments, were filled with soil. The soils used were: sand; 1:1 sand:peat; and 3:1 sand:peat (volume). Two replicates of each soil were used in each compartment. Thus, there were six flats for each CO₂ treatment.

Soil was chemically sterilized with methyl bromide (CH₃Br) at a rate of 0.5 kilogram per cubic meter of soil. This was done by covering all flats with a polyethylene plastic cover. The methyl bromide container was placed under the cover, and a fan was used to circulate the fumes equally to all flats. Twenty days after soil sterilization three caryopses of NK 125 grain sorghum were placed in each hill at a depth of one inch. Hills were spaced equidistantly in the flats. Then plants were thinned to a density of 494,000 plants per hectare. Some lesser stalk borer damage was observed. Pyrethrin dust was applied twice to control this insect at the rate of 10 grams of 0.1 percent pyrethrin per flat.

Table 1. Summary of agronomic and yield data for sorghum plants grown at three different concentrations of CO₂ in an enclosed environment.

CO ₂ level	Dry weight of leaves and stems/flat (grams)	Dry weight of roots per flat (grams)	Leaf area ratio (cm ² /gr)	Number of tillers per plant	Number of heads produced per flat	Mean length per head (cm)	Total weight of heads per flat (grams)	Weight per head (grams)	Grain yield per flat (grams)	Grain per head (grams)	Weight of 100 caryopses (grams)
300 ppm	393.33	272.00	246.2	2.81	86.50	15.32	320.33	3.66	190.41	2.16	2.45
1200 ppm	689.33	387.33	229.4	4.03	53.50	20.37	438.76	9.39	293.50	6.50	2.66
2400 ppm	548.16	498.00	257.4	3.70	45.83	21.37	527.71	12.31	375.18	8.90	2.69
L.S.D. (.05)=	149.08	122.6	ns	ns	6.44	0.89	ns	0.291	75.77	0.314	ns
(.01)=	ns	ns	ns	ns	9.26	1.28	ns	0.419	ns	ns	ns