EFFECT OF THE TEMPERATURE OF THE ROOT ENVIRONMENT ON GROWTH OF SOYBEAN PLANTS

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ROOT temperature as a factor in the growth of soybean plants has not been investigated as far as the writers are able to learn from a review of the literature. However, attention has been directed to this problem by several investigators for other species of plants. Bailey and Jones (1) showed that the average height and average total linear growth of blueberries increased with increasing root temperatures from 13° to 32° C, with the average total linear growth somewhat more closely correlated with the temperature treatments than the average height. No dry weight data of plants were given. Batjer, et al. (2) presented data which indicated that a root temperature of 7° C was less favorable for the growth of young apple trees than the average greenhouse temperature of approximately 24° C. The work of Kincaid and Gratz (3) indicates that the temperature of the soil is an important factor in the growth of tobacco. Their results showed that the minimum soil temperature for top development was about 9° C, the maximum about 40° C, and the optimal range from about 24° to 32° C. A few data presented by Stuckey (4) show that the dry weight production of colonial bent grass was favored by a soil temperature of 16° C as compared to 10° or 27° C. According to Wort (5) Marquis wheat gave a gradually decreasing dry weight yield of tops and roots with a rise in soil temperature from 22° to 42° C.

These studies show that the temperature of the root environment plays an important role in plant development and consequently unless root temperature is properly adjusted to the aerial environment, it may limit or cancel the response of plants to other factors under investigation. Therefore, it was thought advisable to ascertain the influence of root temperature on the growth of soybean plants in order that this factor may be controlled in other experimental work.

MATERIALS AND METHODS

A view of the apparatus used in maintaining different temperatures around the roots of the soybean plants in this investigation is shown in Fig. 1. Each of the seven box-like units is equipped with heating and cooling coils operated thermostatically. Electrical space heaters provide heat. A common refrigerating compressor supplies the cooling for the units, the refrigerant for each box being controlled by a solenoid valve in the liquid line ahead of the expansion valve for that box. A double pole thermostat with an adjustable differential maintains

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1A publication by the U. S. Regional Soybean Laboratory, a cooperative organization participated in by the Bureau of Plant Industry, Soils and Agricultural Engineering, Agricultural Research Administration, and the agricultural experiment stations of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Virginia, and Wisconsin. Received for publication April 3, 1945.

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3Figures in parenthesis refer to "Literature Cited", p. 735.