EFFECTIVENESS OF FERTILIZATION AND MANAGEMENT IN INCREASING YIELDS OF PASTURES IN INDIANA

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Pasture production in Indiana is limited by many factors, including weather conditions, fertility of the soil, and grazing management. The research upon which this paper is based was designed to study the basic principles of pasture production, and to discover how certain factors limiting production might be overcome.

We shall have a clearer understanding of the problems of pasture production if we recognize that the production of pasture is a manufacturing process. If any condition is not met, or if raw material is not being supplied in adequate amounts, production will be reduced. Maximum production can be attained only where adapted species (good germ plasm) are present, where the environment (moisture, temperature, drainage, etc.) is satisfactory for growth, where the raw materials (minerals, nitrogen, etc.) are supplied in adequate amounts, and where grazing management (maintenance of carbohydrate reserves) is intelligently practiced.

SOME FACTORS OTHER THAN SOIL FERTILITY

TEMPERATURE

Temperature is one of the most important factors of climate affecting the growth of pasture plants in the Corn Belt. The influence of temperature upon the growth of more important grasses has been well investigated by Brown. He has shown that Kentucky and Canada bluegrass make considerable growth at 40° F and that the optimum temperature for herbage production is between 80° and 90° for these grasses. He states, “The optimum temperature for root and rhizome production was 60° for Kentucky bluegrass and 50° for Canada bluegrass.” He states further, “Kentucky and Canada bluegrass were severely injured by continued air and soil temperature of 100°. The injury appeared to result in a large measure from the high soil temperature rather than from the high air temperature.”

Brown also found in Kentucky and Canada bluegrasses that the percentage content of nitrogen-free extract declined with rising temperature and crude fiber content increased in percentage as the temperature rose from 40° to 60° and changed little with further rise in temperature. The percentage of crude protein declined slightly in Kentucky and Canada bluegrasses as the temperature increased from 40° to 60° and then increased slightly as the temperature rose above the optimum for growth.

MOISTURE

That moisture is one of the most important factors in pasture production throughout the Corn Belt is well recognized. In Indiana, moisture becomes a limiting factor for the production of permanent pasture sometime during the growing season. In the past four years during which a fertilizer experiment has been conducted in three different locations in Indiana, moisture has been a limiting factor during the growing season in 3 out of 4 years. Figs. 1 and 2 indicate the influence of the moisture supply upon the response which may be expected from fertilizer treatment. The data indicate very clearly that if moisture is deficient the expression of the response from fertilizer treatment is considerably reduced.

ORGANIC FOOD RESERVES

Several investigators have reported studies of organic food reserves in pasture plants. Some of these studies by Brown has led to the conclusion that widely divergent opinions are held as to the

Fig. 1.—Influence of moisture supply upon response to fertilizer treatment, Lafayette, Ind. Data are based on total season yields. In a permanent pasture where bluegrass and white clover are the dominant species, adequate moisture supply is very important for the full expression of the response from fertilizer treatment. In such a pasture the addition of nitrogen to an application of phosphorus and potash gives a greater response than where only phosphorus and potash are applied. Usually the first limiting factor for the growth of grasses in such a permanent pasture. This is particularly true where moisture is adequate only in the spring.