

OBSERVATIONS ON THE RELATIONSHIP BETWEEN SOIL TREATMENTS AND LODGING OF SORGHUM*

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In September, 1938, severe lodging was observed in a sorghum planting (darso) on the Oklahoma Agricultural Experiment Station Farm at Perkins, Oklahoma. The trouble had been present for one or more years past. Judging from symptoms alone, the disease was first thought to be the well-known *Pythium* root rot (Elliott and others 1937), but subsequent study has shown that it is not caused by *Pythium arrhenomanes* but appears to be identical with the lodging observed in Texas (Dunlap 1938), and in India (Uppal, Kolhatkar, and Patel 1936), and ascribed to the "charcoal-rot" fungus, *Sclerotium bataticola*. The Perkins disease was a general infestation in plots used for testing the effect of fertilization on sorghum production, and thus afforded an excellent opportunity for studying the effects of soil treatments on the lodging disease.

The planting consisted of 17 plots, 12 of which had been treated with various combinations of complete fertilizer, manure, phosphorus, potassium, and crop residue. Half of each plot was limed, the other half unlimed. In general, the soil was highly suitable for sorghums, weed free, and uniform. Adequate moisture was available in 1938.

Lodging was observed only in darso, not in nearby fields of sorgho, or kaffir. Every darso field observed in Lincoln and Payne Counties, Oklahoma, showed some diseased plants. Yellow dent corn at Perkins was similarly and severely affected. The Perkins field had been terraced, and the diseased plants occurred only on top of and between the terraces, not in the terrace ditches. In the ditches, however, the stands were poor and the plants may have been killed by the disease earlier in the season. The sorghum was well headed at the time of these observations.

The end plots and side rows had practically no dead plants, suggesting that moisture may have favored the disease. The diseased areas of plants were not of any characteristic shape; they appeared singly and in groups. There were many spots in which all of the plants were diseased. These areas were generally two or three rows wide by about 10 feet long.

In the spring the entire planting had been blocked to an even stand, and at that time the stand was equally good in the limed and unlimed halves of the planting. When the crop was reaching maturity, counts were made of the number of surviving plants, number of diseased plants, and number of dead plants in each row, limed and unlimed. These counts showed a much higher percentage of diseased, dead, and missing plants in the unlimed half. (Figure 1). No well-marked correlation was seen between soil treatment and disease other than this relation to liming.

The healthy plants were erect, with large heads well filled with plump, deep red, bright seed, larger than average. The glume covered less than half the seed, and the grain threshed easily. The majority of the diseased stalks were on the ground, having broken over from one to six inches above the ground, but where the diseased stalks were single or few together, they did not lodge as badly as in the larger spots of affected plants. The

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heads were as long as healthy heads with an equivalent number of seeds, but smaller in diameter, with rough, shrivelled, pale red or light-brownish seed. At least 3/4 of the seed was covered by the glume. After studying the protrusion of the peduncle and distance of the head from the flag leaf, and finding that equal numbers of leaves occurred on diseased and healthy plants, it was concluded that the heads were in the boot stage before the lodging became injurious.

The roots of the diseased plants were dead and hollow. The stalks were hollow and showed numerous black sclerotia on the fibro-vascular bundles. The condition of the stems was apparent from the outside. The weaker the plant, the higher in the stalk (12" to 24") did the hollow rot extend above the reddish crown.

Numerous nutrient and water agar cultures were made from parts of roots, crown, fibro-vascular bundles, and the soil near the roots. The fungus *Sclerotium bataticola* Taub. grew from all the cultures, predominating over the bacteria and molds which also developed in the cultures. Microscopic examination showed that the sclerotia present in the hollow stalks were typical of those of *S. bataticola*. Infection experiments were not undertaken.

LITERATURE CITED

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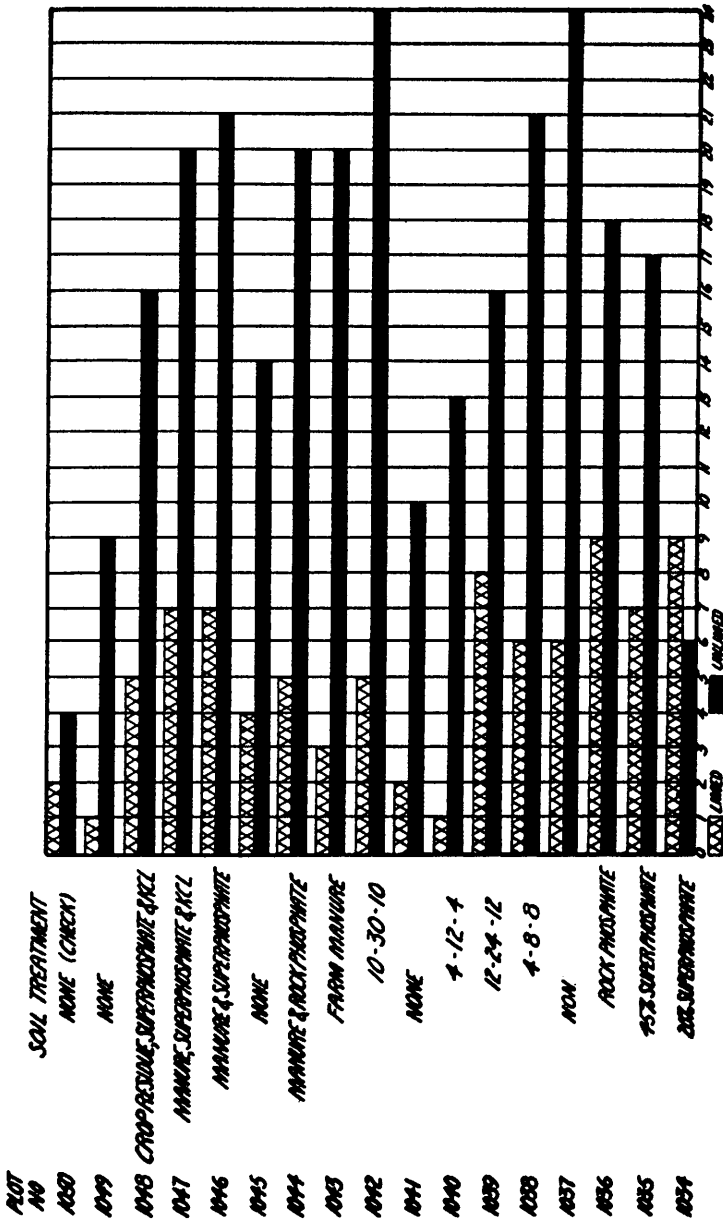


FIGURE 1. Relation between fertilization and occurrence of sorghum lodging, Perkins, Oklahoma.