A Nutritional Disease of Oats Apparently Due to the Lack of Copper

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A deficiency of available copper in the soil is reported to have caused a nutritional disease of oats in Europe (*1*) and in Australia (*2*), but apparently this disease has not been reported in this country. However, a similar disease has appeared in oats planted on the Experiment Station Farm at Gainesville, Florida, and this report is concerned with the symptoms of the trouble and the remedy for it.

The oat variety, Florida 167, when grown on certain parts of the Experiment Station Farm, has exhibited for several years an apparent nutritional disease. Others varieties have been affected, although they have been grown to a lesser extent. The symptoms of this disease develop on this variety as follows: After being seeded at the usual planting time in November, the oats come up and at first appear normal. The only difference detected after about two months is that the affected oats are smaller than nonaffected plants. In later stages of growth, about three degrees of severity of the symptoms have been noted, namely, severe, moderate, and slight. In severe cases the leaves begin to show a characteristic marginal chlorosis early in February. As the disturbance progresses, the margin and tips of the leaves become brown or may look as if they have been scorched. Tillers begin developing about the middle of February. The emerging tips forming the bud of the tillers frequently are rolled up tightly, and the rolled-up part becomes light colored, then brown, and eventually may die. After that the entire plant may die or may struggle along, putting out new tillers which in turn develop similar characteristics. Such plants produce practically no heads and little foliage. If the condition is moderate, the plants will have some of the characteristics described above. New tillers develop late, which results in the plant material being immature at normal harvesting time. The oats produce heads, but instead of ripening to a normal yellow color, these heads tend to have a whitish-green color, and very little grain is produced. Slightly affected plants appear normal except for considerable blasting and light grain. Sometimes the upper leaves, which cover the head just as it emerges, are chlorotic and may even appear scorched. Symptoms of this nature on this variety have been observed on several farms in central Florida.

Affected plants seem to develop wiry roots that show root rot in various stages, but this is probably secondary in nature. There was no apparent difference in the amount of *Helminthosporium* leaf spot on affected and normal plants.

Field experiments, in which the Florida 167 variety was grown, were conducted in a badly affected area[1] in an effort to determine the cause of the abnormality. In one set of experiments a uniform liberal application of the major fertilizer elements, nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur, was applied. In addition to the major elements, copper, zinc, manganese, boron, and molybdenum were applied to the soil in all possible combinations before seeding the oats. The copper was applied as copper chloride at the rate of 10 pounds/acre. The seed were treated with New Improved Ceresan. In another experiment an assortment of treatments were tried including fertilizer, rate of top dressing with nitrate of soda, seed treatment with New Improved Ceresan, and the minor elements in combination with these.

Oats which did not have copper developed severe symptoms of the disease and produced practically no grain. The foliage was small, and very few plants even produced heads. Oats grown on every copper treatment were either free or practically free of the described disease and produced relatively good yields. The only treatment of value was copper. Top dressing with extra nitrate of soda seemed to accentuate the trouble.

Copper chloride which was applied in 1944 to old fertility plots and copper sulfate which was applied in 1942 had a pronounced residual effect on the yield of oats and largely prevented the disease. The disease was prevalent in other parts of the old fertility experiment.

A more detailed report will be published elsewhere.

[1] The soil type is Arredondo loamy fine sand.

References

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The Migration of Newly-hatched Loggerhead Turtles Toward the Sea[1]

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The initial adaptations of newly-hatched loggerhead turtles may be divided into three major behavioral sequences: (1) escape from the deep nest on the ocean beach; (2) direct migration to the sea immediately after escape; (3) orientation toward deep water once the ocean surf is reached.

The conditions of development of the loggerhead turtle preclude the possibilities of prenatal stimulation in determining the remarkable adjustments of the newly-hatched animal. The nest of these turtles, a hole in the sand about one foot in diameter and two feet deep, is installed in midsummer months by the adult female, which immediately afterward returns to the sea. Each nest contains from 50 to 200 eggs. After an incubation period of about 7 weeks the young turtles hatch, mill around in the nest for 3–5 days, emerge as a group, and make a rapid run for the ocean. Although the crawl from the nest to the water may cover a distance as great as 25 yards, no errors are shown in direction of crawl. Once in the water, the animals swim toward the open ocean. The escape from the nest, which occurs typically at night, is accomplished by slow activity in the nest, which raises the nest floor gradually to the beach surface by knocking sand from above.

The guiding physical stimuli which determine the nest-to-sea movements of the young loggerhead have been the subject of some previous investigations. Hooker (*2*) and Parker (*3*) have referred to positive geotropic reactions, visual hue discrimination and preference, and discrimination of visual "openness" (the uniformity of the ocean horizon) as possible means of explaining the oriented crawling.

In order to determine the critical stimuli for the directing of

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