COTTON RUST EPIDEMIC OF 1965

By Lester M. Blank, Arlen D. Davison and R. B. Streets

Southwestern cotton rust has been known in Arizona for over 40 years, being relatively mild in most years but occurring in damaging intensity in occasional years. The 1965 season appears to be a record one in both distribution and intensity of damage in certain areas.

The rust fungus has two host plants, cotton and gramagrass. During any given year it is present for 10 to 11 months on grama and returns to cotton for a 4 to 6 week period in July and August.

The movement from grama to cotton is associated with, and dependent upon, showery weather followed by periods of high relative humidity. Under such conditions the over-wintered spores on grama germinate to produce tiny spores which may drift for miles through humid air before coming to rest on moist leaves of cotton.

Infects Upon Contact

Infection occurs immediately and the fungus is safely established within the tissues of the cotton host. Pinpoint-sized lesions are evident on the leaf within 4 to 5 days and these rapidly increase in size and become orange-red in color. There is no spread from cotton to cotton, and the orange spores produced so abundantly on the under side of cotton leaves serve only to return the fungus to grama.

When moist conditions continue into September and October, there is a considerable grass-to-grass spread of the rust before it goes into the overwintering stage. A favorable condition for an outbreak of rust is provided when 1) cotton is grown in the vicinity of infected grama and 2) showery weather occurs in July and August.

To understand the causes of the serious outbreak of 1965 it is necessary to consider the 1964 season, also, for it was one of the prime factors contributing to the 1965 outbreak. Rust was present in 1964 on cotton in Santa Cruz, Pima, Pinal, Graham, Greenlee and Cochise counties in minor to moderate amounts, but there were adequate spores to provide for movement of the rust from cotton to grama.

The 1964 season was one of the most favorable in many years for growth of grama grass in southern Arizona, and the grass-to-grass spread of the rust fungus was extensive. For example, the overwintering stage on grama was found as far as seven miles from the nearest cotton fields in the Continental area, Pima county. Surveys during the winter of 1964-1965 disclosed a heavy buildup of inoculum on grama in certain areas. This information was brought to the attention of cotton growers in Pima, Santa Cruz and Cochise counties by the Agricultural Extension Service,

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BELOW, COTTON LEAVES damaged by rust. Infection of this intensity results in reduced food manufacture and premature shedding of bracts, bolls and leaves.

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and control measures were recommended.

The potential hazard of an outbreak of rust became a reality in July and August, 1965, when summer rains occurred in average or above-average frequency in localized areas. Rainfall was recorded on 14 days in July at the Tumacacori reporting station, on 7 days at Sahuarita, and on 12 days at a location northwest of Elfrida. Usually occurring as late afternoon or evening rains, these provided many nights with high relative humidity, and with temperatures favorable for production and dispersal of the infective spores.

This resulted in frequent and heavy movement of spores from the 1964 grama, and very extensive infection of the cotton tissues. In contrast, at a test-plot location in the Avra Valley rainfall occurred on but three dates in July, and only a trace of rust developed. Showery periods and high humidity are required not only for production and dispersal of infective spores from the grama grass, but also for the production of new grama and for return of the rust from cotton to grama.

10 Years of Research

Research directed toward the control of cotton rust has been under way for the past 10 years in laboratory, greenhouse, and field experiments. In laboratory studies we have learned much concerning the temperature and moisture requirements for germination of the rust spores, and for infection of cotton. In greenhouse screening trials, almost a hundred fungicides have been tested for their effectiveness in controlling the rust fungus. These were applied as sprays either before or after the cotton plants were exposed to the infective spores from overwintered grama.

The better fungicides have been continued into field trials for final evaluation. Many fungicides were completely ineffective, while others gave partial to good control. However, none of the fungicides was effective when applied *after* infection by the rust fungus had occurred.

The most effective fungicide for field control is zineb, zinc ethylenebis (dithiocarbamate), a 75 percent wettable powder. This is used at the rate of two pounds per 40 gallons of water per acre, plus a spreader-sticker additive. Ground-rig application at this gallonage per acre is recommended in order to obtain the necessary coverage of the plants. Plane applications at lower gallonages per acre have been only partially successful, due to the lack of coverage of plants with the protective fungicide, and dust applications by plane or ground-rig are ineffective.

Apply Before Rains Start

The first application of the protectant fungicide is recommended for early July, just ahead of the average date of onset of summer rains. Two additional applications are recommended at 10 to 14 day intervals, thus giving effective protection until near the middle of August. The cost of materials and applications by ground-rig equipment is about $11 to $12 total per acre for the three applications. In a field test in the Continental area in 1964, under conditions of moderately severe rust, the zineb treated plots gave a yield increase of 40 percent over that of the untreated plots. This increase in yield paid the cost of treatment many times over.

The question has been raised as to what we face in regard to a rust outbreak in 1966, and the question cannot be answered at this time. It will depend upon 1) how much rust inoculum is developed on the current crop of grama grass and 2) on the rainfall situation which will prevail next summer. The first condition can and will be determined by surveys of the amount of the overwintering stage on the grama grass, while the second condition will not be known until next summer.

Our Mystery Picture is Seasonal

Where is this highway marker?

Actually, this is an easy one to guess, but we chose it because it seems to have a seasonal ring.

If you turn to Page 18 you'll get the answer — as if you don't already know.

BAD FOR THE BUGS

Agriculture department scientists report they're working on experiments which could lead to commercial use of a new non-chemical tool for controlling insects.

The tool is an insect virus. Research workers have developed practical means of producing a virus which controls the corn earworm; (which also is the cotton bollworm).

Experiments with the virus have indicated it produces effective insect control. The next step will be a series of experiments to make sure the virus is not dangerous to humans.

No danger to humans is expected, because the virus involved occurs naturally on insects in field crops, and no infections have ever been reported among humans or animals, or among any other insects except the one pest which the virus attacks.

The target pest is called both the corn earworm, and the cotton bollworm.