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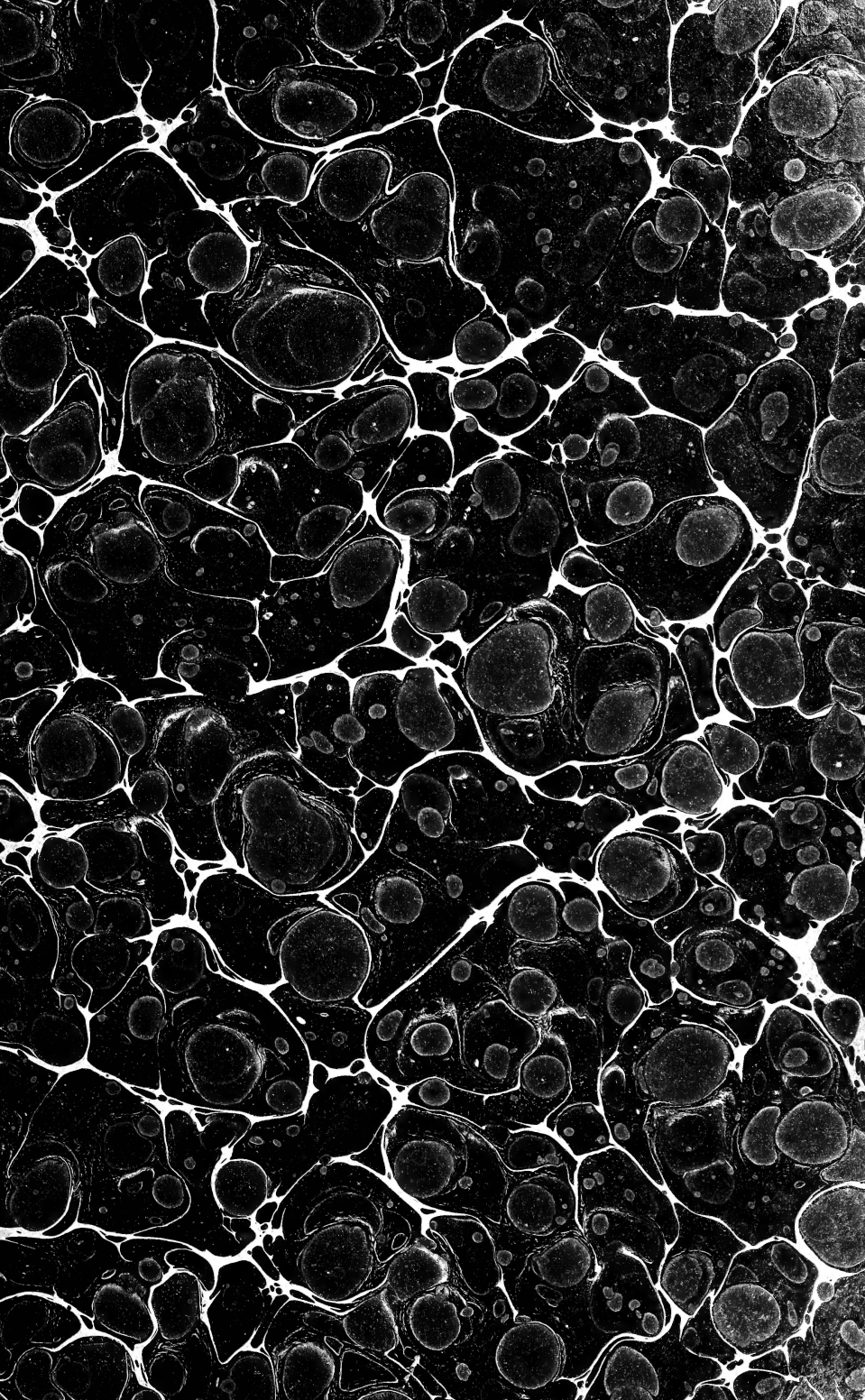
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United States Department of Agriculture,

BUREAU OF ENTOMOLOGY,

L. O. HOWARD, Entomologist.

THE COTTON RED SPIDER.

(*Tetranychus gloveri* Bks.)

By E. S. G. TITUS, *Special Field Agent.*

Injury to cotton by the red spider, or rust-mite as it is also called, has been quite prevalent in some sections of the cotton-growing area of this country during the past two years. The cause of the injury is a minute yellowish-red mite which feeds on the cotton plant, principally on the under sides of the leaves, but at times attacking all parts of the plant. The mites usually appear early in the season, but do little appreciable damage until midsummer or later. The injuries rarely become serious unless accompanied by long-continued dry weather; in such an event the multiplication of the mites is very rapid, and the consequent injuries are often sufficient to kill the plants.

The early attacks of this mite are quite characteristic; the leaves presenting on the upper side near the base a scarlet appearance, which, occurring at first between the larger ribs, gradually spreads over the leaf as the mites multiply, then dies out and is replaced by a dirty yellow, the leaf finally shriveling and falling to the ground. Larger and older leaves show the effect of the attack before younger leaves.

The mites feed on the under side of the leaves, protected by a loose, irregular web stretching at first from vein to vein, but later attached at any point and in cases of severe injury sometimes covering both sides of the leaf.

Rarely have the red spiders been found feeding on the upper side of the leaves, and then only when they are protected or shaded by the leaves above, or when a leaf has begun to curl from their injuries.

When present in considerable numbers almost all parts of the plant may be attacked—flowers, squares, bolls, and stems. Severely injured plants lose most of their leaves, flowers, and younger forms; quite often only the young unfolding leaves at the tips of the branches are left green.

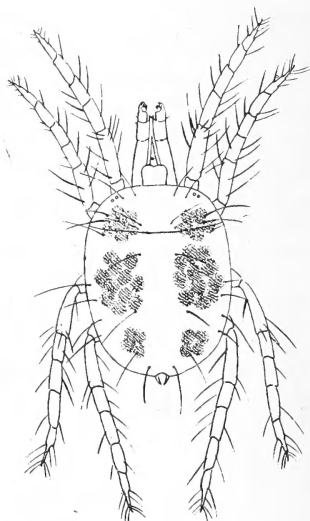


FIG. 1.—*Tetranychus gloveri*: Adult—much enlarged (original).

This species was first described by Mr. Nathan Banks, of the Bureau of Entomology, in 1900,¹ from specimens collected on cotton by Prof. H. A. Morgan, of Baton Rouge, La. In 1893-94 it had caused considerable damage at Baton Rouge.² The pest is very probably distributed throughout the entire cotton-growing area of the South, although during late years its occurrence in injurious numbers had not been reported until the summer of 1903, when it caused considerable damage to cotton in South Carolina and Georgia. In 1904 red spider was found on several plantations near Batesburg and at other points in South Carolina. During the summer of 1905 many reports of its occurrence were received from points in North Carolina, South Carolina, Georgia, and Alabama, and the writer found it in injurious numbers at several localities in these States.

The first published records of the species appear to be those by Townend Glover, in an article on Cotton Insects published in 1855,³ in which he gives a description of the mite and its injuries to cotton under the name of "The Red Spider. *Acarus?*" and in 1878,⁴ in his Cotton Insects under the name of "cotton rust," again referring the injury to an "acarus." He recommends powdered sulphur or sulphur mixed with slaking lime as remedies.

LIFE HISTORY.

When first deposited the eggs appear as minute translucent pearl-like objects, found only by careful observance on the threads of the web, on the plant hairs beneath it, and more rarely on the epidermis of the leaf itself. As they mature they grow darker, becoming quite opaque, with more or less of a red or greenish tinge.

The eggs hatch in from three to five days during hot, dry weather, and the young mites commence feeding almost immediately. At this early stage they have but six legs and but few red markings. They reach maturity in from ten to fourteen days after hatching. At maturity the mites vary from specimens with very small red spots to those that are all red on the dorsum and have the legs lightly marked with red dots. The mature mites are eight-legged. According to Mr. Banks, the adults of this species are distinguished by the following characteristics: Bristles of body not arising from tubercles; tarsus with but one claw, which is strongly bent near its middle and four-cleft beyond; three fingers on the tip of the thumb, which is not as long as the claw, the middle finger largest from side view; mandibular plate broad, sides concave near tip and apex truncate or slightly broadly emarginate (fig. 2).

¹1900: Banks, Tech. Series 8, Bur. Ent., Dept. Agric., pp. 76-77, fig. 15.

²1897: Morgan, Bul. 48, La. Agric. Exp. Sta., pp. 130-135.

³1855: Glover, U. S. Patent Office Rept., p. 79, Pl. VI, fig. 7.

⁴1878: Glover, Cotton Insects, plate 3.

Where and in what stage the mites hibernate is not known, but it is probable that the early spring generations live upon some other than the cotton plant, probably upon various weeds and in some sections on water-oak.

MEANS OF DISTRIBUTION.

The distribution of mites over a field may be accomplished in several ways. The minute mites cling to almost any substance that brushes so forcibly against them as to remove them from the plant; and when brought in contact with plants farther along the row, or elsewhere, they will be brushed off and cling to them. The mites have been taken from several insects, such as grasshoppers and small Hemiptera, found visiting the cotton plants. Probably the most common means of distribution occurs during the cultivation of the crop. The hoe gangs and the cultivators rapidly and thoroughly scatter the mites over the field. Hoe gangs will spread them broadcast—down the rows during their daily labor, and across the field when they leave it, since they usually go by the shortest route. The effect of distribution along the rows can be most easily traced in terraced cotton.

The writer in 1904 and 1905 made short trips to South Carolina to study this pest. In several instances it was noticed that from a point on the margin of a field where there were growing large poke-berry plants (*Phytolacca decandra*) the infestation by red spider had spread over a fan-shaped area of the adjoining cotton. Other places

were seen where this same weed occurred on terraces, and here also the mites were present in considerable numbers on adjoining cotton. At that time of the year (July and August) these weeds, as well as the cocklebur (*Xanthium* spp.), showed the effect of red spider work. The mites were too scarce, however, for positive identification. Specimens occurring on corn, cowpeas, and beans were identified by Mr. Banks as the cotton red spider. These plants all showed appreciable injury by the pest. Especially was this true of one field of corn that was planted in a cotton field, the rows alternating.

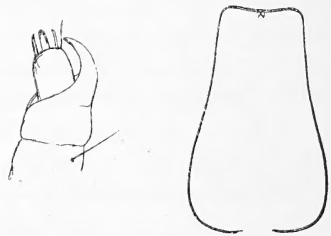


FIG. 2.—*Tetranychus gloveri*: Palpus and mandibular plate—enlarged (from Banks).

METHODS OF CONTROL.

Enemies.—No parasites have yet been reported as living in this red spider. However, there are several species of predaceous insects that prey upon the mites and their eggs. Among these are larvæ of Chrysopas or lacewings, and lady-beetle larvæ and adults. One species of *Pentilia*, a minute black lady-beetle, is very destructive to the red spider; this and other Coccinellids (lady-beetles) were noticed feeding on the mites at several places visited in 1905.

Cultural methods.—These are: (1) Rotation of crops. (2) Destruction of cotton stalks, weeds, and grasses in the infested fields after cotton picking is over in the fall, by pulling and burning where possible. (3) Deep fall or winter plowing, taking care to thoroughly turn under all the vegetation. (4) Burning off or otherwise destroying the weeds, grasses, and rubbish on the terrace edges, ditches, and borders of the field. (5) *Keeping down all weeds and grasses in the early spring.*

Remedial measures.—A careful outlook should be kept on the young cotton in the early spring, and at the first indication of injury prompt action should be taken. If, when first noticed, there are but few infested plants, these may be pulled and burned, care being taken not to distribute the mites to the surrounding cotton during the operation. The cotton surrounding the infested place should then be thoroughly sprayed with one of the mixtures described below, preferably one containing sulphur. Spray the plants thoroughly, taking especial care to cover the *under sides of the leaves* and the stems and branches.

If a large area is infested when first noticed, or if it should be found desirable to spray whole fields, a barrel or tank outfit should be used. The pump should have no copper about it, a brass cylinder being preferable. With one man to pump and two lines of hose, very rapid work can be done. Sufficient hose should be used to allow free movement around the plants being sprayed. It will be well to have an iron pipe attached to the hose with the outer end bent upward and threaded for the attachment of the nozzle. The pipe should be long enough for this elbow to reach the ground when the man doing the spraying is standing upright. Use a nozzle distributing a fine spray. By this means the under sides of the leaves can be easily sprayed by simply moving the pipe up and down through the plant.

Among the many remedies that have been used against red spiders on various occasions the *sulphur mixtures* stand foremost. *Water*, *kerosene emulsion*, and *soap washes* will also kill many of the mites and some of the eggs. There will, however, be some eggs left to hatch, and these sprays leave nothing on the leaf to kill the young freshly hatched mites. No spray can be expected to reach all the mites or their eggs, but the sulphur preparations, when properly prepared and applied, adhere to the leaves, and there will be enough sulphur left on the leaf to destroy most of the young mites that appear later.

INSECTICIDE FORMULE.

Sulphur.—Ordinary powdered sulphur can be used dry, blown from one of the powder guns manufactured for dry sprays. It may also be used mixed with flour, road dust, or plaster of paris.

Lime-sulphur.—Into slaking lime dissolve an equal amount of powdered sulphur. If only a small quantity is to be made, the heat gener-

ated by the slaking will be sufficient to cause the sulphur and lime to unite. If considerable quantities are being prepared, it will be well to slake the lime in boiling water in an *iron kettle* (never in copper) and keep the mixture boiling for a short time after the sulphur has become well incorporated. The mixture should be constantly stirred until it is smooth and even. Five pounds of sulphur and 5 pounds of lime will make, after diluting, 100 gallons of spray mixture. This may be used stronger, if desirable, but care must be taken not to injure the plants.

Lye-sulphur.—"Mix 20 pounds flowers of sulphur into a paste with cold water, add 10 pounds of pulverized caustic soda (98 per cent). The dissolving lye will liquefy the sulphur and boil. Water must be added from time to time to prevent burning until a concentrated solution of 20 gallons has been obtained. Two gallons of this is sufficient for 50 gallons of spray, giving a strength of 2 pounds of sulphur and 1 of lye to 50 gallons of water."¹ This has been successfully used against the orange red spider in California.

Kerosene emulsion.—Dissolve 1 pound hard or 1 quart soft soap in 1 gallon hot water, add 1 gallon coal oil, and emulsify. The most thorough and feasible method is to pump the spray mixture back upon itself until it is thoroughly emulsified. Dilute to 10 gallons and use as soon as possible. With the recent advent of a certain naphtha soap which will emulsify without heating, kerosene emulsion can be readily made in the field with cold water.

Water.—This treatment is quite commonly used by greenhouse men in fighting red spider in propagation houses, conservatories, and parks. The water is driven onto the plants in a fine spray with considerable force.

¹ 1903: Marlatt, Farmers' Bul. 172, U. S. Dept. Agr., p. 41.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., *October 30, 1905.*

