

traps are not expected to reduce noticeably the number of beetles, but serve to give an idea of the relative abundance of the insects in any particular area. In 1937 111,000 traps were set in 25 States scattered from Florida to Vermont.

On the basis of the past three years of trapping, it seems that the abundance of beetles in several of the locally-infested areas has decreased. This is especially noticeable in the middle western States. In St. Louis in 1934 the catch was 1,351 beetles; in 1935, 1,232; in 1936, 88; and in 1937 only one lone beetle, despite the fact that the trapping was more intensive than ever and that more than 12,000 traps were in use in that one region. In Detroit the catch fell from 128 in 1936 to 67 in 1937. In Chicago there were 3,740 beetles trapped in 1936, but only 384 in 1937.

This great reduction in the number of Japanese beetles trapped is a good indication that the number of beetles and resulting larvae in these particular areas is decreasing.

Treatment of turf with arsenate of lead is a necessary part of turf maintenance in the areas of continuous infestation and isolated places where the turf is definitely known to be infested by the Japanese beetle larvae. However, the above examples of reduced infestation indicate that there need not be any haste in poisoning golf courses as a precaution against Japanese beetle damage merely because the insects have been observed in the neighborhood.

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An instructive article on the Japanese beetle and its habits is contained in a bulletin issued by the United States Department of Agriculture in December, 1934.

Chinch Bugs

CHINCH BUG injury to golf course turf has been recognized for many years. Recently this pest has become increasingly troublesome in eastern States, especially in rather restricted areas of New York, New Jersey, Connecticut, Pennsylvania and Ohio.

Three common varieties of chinch bugs—the common chinch bug (*Blissus leucopterus*), the hairy chinch bug (*Blissus leucopterus hirtus*) and the southern chinch bug (*Blissus leucopterus insularis*) — cause extensive damage to turfed areas and farm crops in the United States.

Until a few years ago these were all regarded as one type, but recent work has disclosed that the variety which causes severe injury to turf in the eastern States is more hairy in appearance and more difficult to control than the common one which attacks farm crops in the Middle West. Because of its hairy appearance it is commonly called the hairy chinch bug. This type is more vigorous, less susceptible to insecticides and able to withstand more moisture than the common farm chinch bug.

The common variety which is found in the Middle West, especially in the regions drained by the Mississippi, Missouri and Ohio Rivers, frequently causes severe damage to grain crops. However, injury to pastures and other turfed areas has been reported. The hairy chinch bug has been reported in the States along the Atlantic Coast, being abundant in Long Island and surrounding areas of New Jersey, Pennsylvania, Connecticut and occurring westward to Ohio.

The southern variety occurs in the extreme southeastern United States, especially in Florida, where it severely injures lawns and fairways.

Since the general distribution, life history, habits and methods of control when attacking turf are much the same, they will be discussed collectively.

Description and Habits

These pests are native to the United States and probably infested the native grasses when the white man first settled here. Chinch bugs are probably present in grassland every season, but escape attention because of their small size and habit of feeding near the ground. Unfavorable weather conditions may prevent serious outbreaks, and since the pest is not easily noticed its injury is usually attributed to other factors.

The adult chinch bug is slightly less than one-eighth inch long, and about one-half as broad as long, being oblong-oval in shape. The insect is black in color, with fine white markings. Its general appearance is a black fore part with the rest of its body dark gray. Its legs, beak and antennae are dark yellow to brown. The wing covers are white with brown veins. There are two adult forms, long-winged and short-winged. The short-winged, which is incapable of flight, is by far the more numerous, especially in the eastern variety.

Chinch bugs over-winter as adults under the shelter of grasses, leaves or other cover. In the spring after several days of warm weather the adults leave their winter quarters and settle in turfed areas. After a short period of feeding and mating, the females lay their eggs. Each female is capable of laying several hundred eggs

at the rate of 15 to 20 a day, requiring from three to four weeks to lay her full quota. These are laid on the stems of the grass close to the ground or, if the soil is loose, upon the roots just below the soil surface. The eggs are usually hatched in from one to five weeks, depending on the temperature. The young bugs are extremely small and are reddish in color, with a transverse band of white. As the insect grows it sheds its skin five times, becoming darker in color each time. This immature form has no wings and crawls from one place to another. In an infested area the insects can usually be found in all stages of growth.

There are two generations each season, except in the extreme South, where three to five generations usually develop. The first brood of the eastern and common variety hatches any time from April to the middle of June, and the second from mid-July to mid-September. Chinch bugs are readily distinguished from other small bugs infesting turf by their strong repugnant odor.

So far as is known, chinch bugs feed only on plants belonging to the grass family. They are sucking insects, obtaining their food by inserting a sharp beak-like organ into the plant tissues, where they suck out the plant sap in much the same manner as a mosquito feeds on animals. They never devour the foliage or the roots of the grass, which explains why stomach poisons such as lead arsenate are not effective in the control of the pest.

In the northern States the hairy chinch bug attacks bent grasses in preference to all others. Certain varieties of velvet bent grass, seaside creeping bent and redtop seem to be particularly susceptible to attacks. The southern species prefers St. Augustine grass. It also infests Bermuda and other grasses. Neglected areas such as sod nurseries are usually more infested than a closely-cut green. Approaches and areas surrounding greens often are severely attacked while the turf on the green is only moderately damaged. Injury usually first appears in high, dry or sandy locations that are exposed to direct sunlight. Areas surrounded by gravel drives or pavements are favorite locations for infestations.

Turf injured by chinch bugs somewhat resembles that suffering from soil moisture deficiency. The grass becomes shriveled and brown in many small spots, which enlarge as the injury increases. Usually there is a distinct border of yellowed grass immediately surrounding the browned areas. These spots are more or less circular and therefore are often confused with brownpatch or scald. The chinch bugs are usually found at the border of these areas, feeding on the grass just above the soil surface. Since this pest never attacks clover or broad-leafed weeds,

the death or weakened condition of the grass favors their growth in these areas.

The abundance and activities of chinch bugs are greatly influenced by the weather. They are active and easily found on warm, sunny days, but hide and are not easily detected during periods of cool, cloudy weather. Frequent heavy rains may destroy large numbers of newly-hatched bugs and cover the eggs with mud, which prevents their hatching. These storms may also prevent the female from laying her full quota of eggs. Severe outbreaks of chinch bug injury usually occur during seasons of less than normal rainfall. Warm, damp weather favors the rapid development of a white fungus which is very destructive to this insect. During prolonged or frequent periods of this weather the fungus practically keeps the pest under control.

Natural enemies such as parasitic insects and birds help to destroy the pest, but are not important factors in its control.

Methods of Control

The hairy chinch bug is less susceptible to the effects of the usual insecticides than are other turf insects. Because of its feeding habits, stomach poisons such as lead arsenate give no control. Contact sprays or dusts are usually resorted to with more or less success.

A spray that is frequently recommended consists of one-half ounce of four per cent. nicotine sulphate and two ounces of soap, dissolved in one gallon of water. The grass should be thoroughly soaked with the spray, as the liquid must come in contact with the bugs to be effective. Another spray that has been used consists of nicotine sulphate one gallon, soap three gallons, and water 300 gallons. This particular spray is applied at the rate of 150 gallons to 1,000 square feet.

In general, all dust treatments give a fair degree of control, with tobacco dust being the most satisfactory. Two applications of tobacco dust (one per cent. nicotine) per brood applied at the rate of 25 pounds to 1,000 square feet seem to give a fair degree of control. Certain sprays and dusts of derris, rotenone and pyrethrum are also effective if properly applied.

None of the treatments developed so far completely eradicates the pest. Its rapid reproduction and migration from untreated areas soon result in renewed heavy infestations, so that treatments must be repeated. The cost of these treatments limits their use to comparatively small areas.