EXPERIMENT STATION

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THE POTATO = STALK WEEVIL.

(*Trichobaris trinotata,* Say.)

One of the important and growing industries in Kansas is the raising of potatoes, especially in that part of the state bordering, on the Kaw river, and extending from Totpeka to Kansas City. A goodly Portion of that area is devoted to the cultivation of this one crop. About Edwardsville and within shipping distance of that Point. Edwin Taylor, one of the largest and most successful potato growers of this state, reports that the number of acres devoted to potato culture exceeds that of corn and wheat combined- C. A. Mann, of the firm of Mann Bros. & Frisbie, large potato growers at Wilder, Kansas, estimated the yield of potatoes for 1897 between Lawrence and Kansas City at about 1,500,000 bushels. From statistics obtained from F. D. Coburn, Secretary of the Board of Agriculture for the State of Kansas. we find that for the year ending December 31, 1896, there were 108,383 acres of potatoes, yielding 7,778,097 bushels of potatoes, valued at $2,138,297.55. Notwithstanding the magnitude with which this industry is at present carried on, there is no doubt but that the potato acreage will

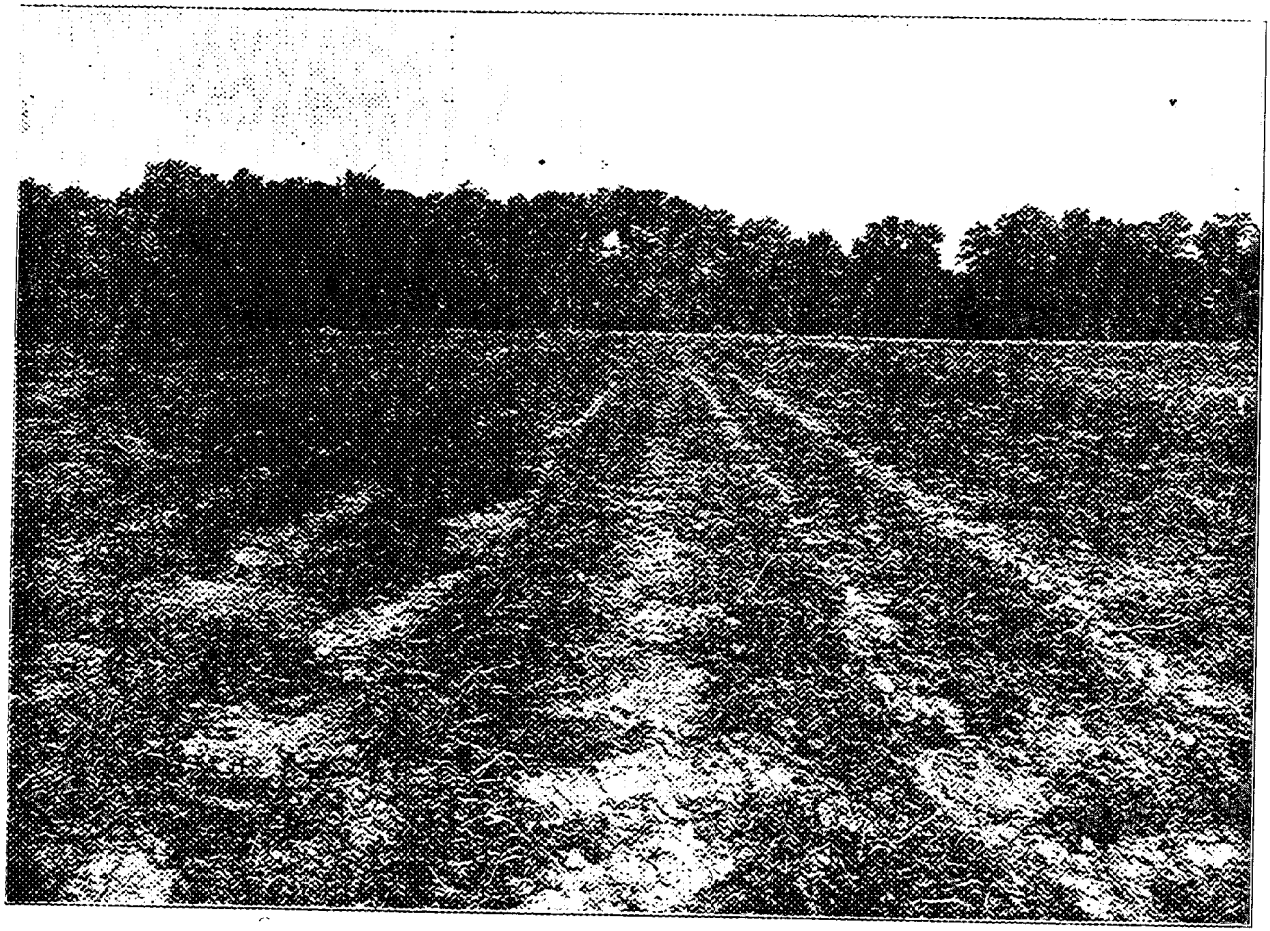

FIG. 1.—A POTATO PLOT INFESTED WITH STALK WEEVIL.

continue to increase; for where potato culture has been pursued understandingly it has yielded profitable returns.

Since potato culture has been so extensively pursued, there have been more or less losses sustained from insect depredations. The Colorado Potato-Beetle, Doryphora decemlineata, has in the past occasioned extensive losses, and is still present here and there in various parts of the state committing more or less damage. As a rule, the potato growers are well acquainted with this pest, and seem to understand the best measures for its control. During the past summer the Flea-Beetle, Epitrix cucumeris. has been quite numerous in various localities, doing noticeable damage. The Stalk-Borer, Gortyna nitela, has been very destructive at various times. It was observed in the state some thirty years ago by Professor Snow, and was first recorded by him in his *"Lepidoptera of Eastern Kansas," as being quite common, being found in the stalks of potato, tomato, dahlia, aster and cocklebur. Another insect that has been very numerous during the past year, and is at present one of the most common, if not the most destructive pest that the potato grower has to combat, is the Potato-Stalk Weevil, Trichobaris trinotata. It was collected in Douglas county in 1873 by Professor Snow, and was first recorded by Professor Popenoe in his list of †"Kansas Coleoptera." He reported it as being common in eastern Kansas.

FIG. 2

In the year of 1897 there seems to have been a special onslaught

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by the weevil. In June of that year, there were many complaints of serious damage to the potato crops by the last two insects mentioned. About the 29th of the same month there appeared in the Kansas City Star an article by Chancellor Snow, calling attention to the work of the Gortyna nitela, and soon afterwards there appeared another by the same writer, in both the Topeka Capital and Lawrence Journal, referring to the damage being done by the Potato-Stalk Weevil.

The investigations carried on by the Department during the past eighteen months plainly reveal the fact that the insect is pretty well distributed over the eastern and east central parts of the state. In Riley county it was found in large numbers. It has been a difficult matter to obtain a correct distribution of the weevil, as many of our correspondents were not acquainted with the insect or its work; and many of those incurring losses seemed not to have attributed to the work of an insect the injury to the vines, for when the stalks were opened, exposing the depredator, it was almost a revelation to them.

From the potatoes planted in the College plots the returns were very disappointing, even from those plots that were mulched and irrigated. It was estimated that in some of the plots 90 per cent of the vines were infested. The percentage infested would have been greater had not the vines been swept with insect nets to obtain specimens for the insectary. It was a difficult matter to compute the exact damage done by the pest to the potato vines, as other factors besides the weevil had assisted in causing a shortage in the yield.

ITS FOOD PLANTS.

The attacks of the Stalk-Weevil are not confined to the potatoes alone, as the insect is to be found in as great, if not greater, numbers in certain weeds which seem to be the original host plants of the insect. The horse-nettle, Solanum Carolinense; cocklebur, Xanthium Canadense; stink-weed, Datura Stramonium; bull-nettle, Solanum rostratum; ground cherry, Physalis longifolia, are all more or less subject to attack by this insect. In several of the weeds, particularly in the ground cherry, the insect is more numerous than in the potato. As many as eight adults have been taken from the stalk of one ground cherry, while in the potato vines we have never found them so numerous; one specimen in the root, and from one to five in the upper parts of the plant. Wherever the above mentioned weeds are allowed to grow wild in any large numbers

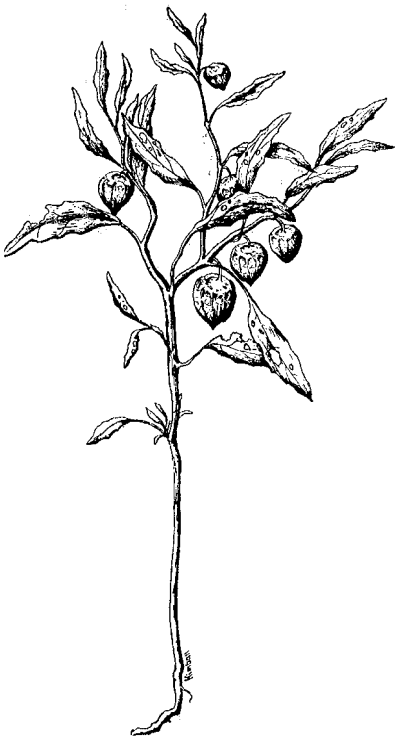

FIG. 3.—GROUND CHERRY.

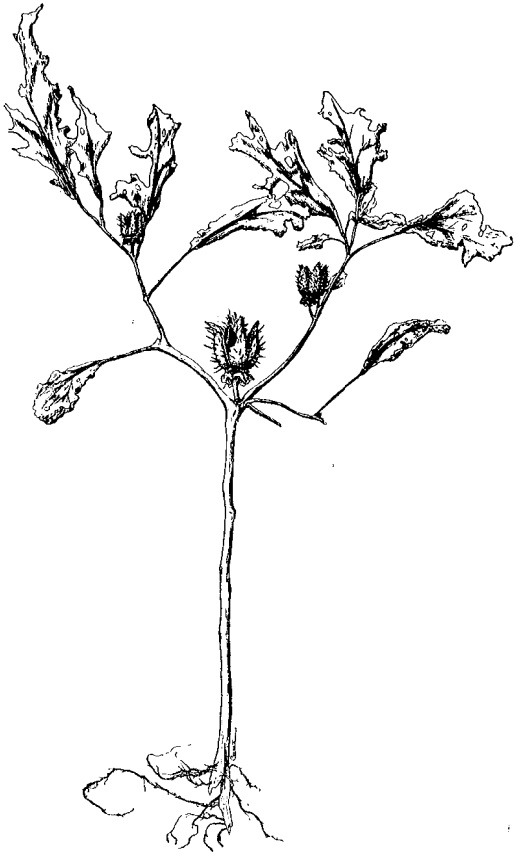

FIG. 4. STINK-WEED

FIG. 5.—COCKLEBUR.

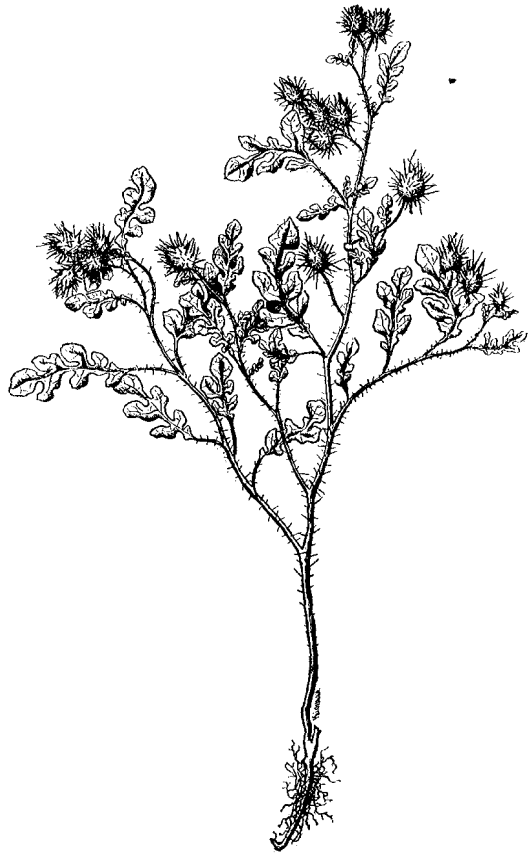

FIG. 6.—BULL-NETTLE

they are a constant menace to potato growing; in that they support the insect in large numbers to infest adjoining potato fields in the spring.

If it were not known that the weevil was common to these weeds, one would never suspect from the exterior appearances of the plants that they were infested, so little apparently does the insect affect their vitality. This is most clearly seen in the ground cherry, stinkweed and cocklebur. On the other hand, the presence of the weevil in the potato is clearly shown by the wilting and dying of the plant, especially in dry seasons. To combat the insect with the greatest success it will not do to confine our operations to the potato alone. This matter will be treated more fully under remedies.

THE STAGES OF THE INSECT.

The adult is a small snout-beetle, as will be seen in Fig. 7. It belongs to the same family of insects as the plum curculio, and has the peculiar beak or proboscis that characterizes this family of insects. It is of an ashy gray color, about one-fifth of an inch in length, and marked with three black spots at the base of its wing covers.

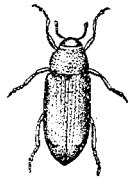

FIG. 7.
Top and side view of weevil.

The pupa is shown in Fig. 8. It is about one-fourth of an inch long and of a creamy color. The earliest date of pupation was July 17. On the 22d of the same month pupae were to be found in large numbers. The pupal stage lasts from about eight to eleven days.

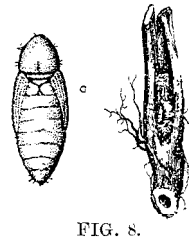

FIG. 8.
a. Pupa.
b. Pupa in channel.

The larva when first hatched is a small, whitish and footless grub. (Fig. 9.) At maturity it averages from six- to eight-sixteenths of an inch in length, with a brown head with dark-colored mouth parts. The body bears a few light-colored hairs.

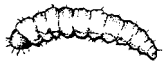

FIG. 9.
Larva.

FIG. 10.
Longitudinal section of stalk, showing egg in position.

The egg of the weevil is of a white color and of an oval form, as will be seen in Fig. 10. It measures about 0.6 of a millimeter in length and 0.4 of a millimeter in width.

HABITS OF THE ADULT.

The weevil passes the winter in the adult stage, remaining till spring in the same plant in which it has passed through its transformations. In some of the weeds, especially the ground cherry, larvae and pupae were found as late as December, and undoubtedly passed the winter in their respective stages.

In the fall of 1897 a large number of infested ground cherries were transferred to a bed of potatoes in the insectary, in order that the time of the emerging of the adults and their habits as well as those of the larvae might be observed more closely. We here append some of the more important notes to compare with the observations carried on in the experimental plots out of doors.

On March 20 the weevils first commenced to emerge, and passed from the old ground cherry vines to the young growing potato vines, which they soon commenced to injure by gnawing irregular holes in the stalks and stems, as shown in Fig. 11.

FIG. 11.
Stem of potato vine injured by adult weevils.

On April 19 the majority of the weevils had emerged from the ground cherries.

By May 20 all adults in the insectary had disappeared.

On April 16 a single adult was captured out of doors upon an old ground cherry vine.

On May 24 the potato vines in the College plots were swept with insect nets, by which a large number of weevils were captured. An examination of the vines revealed the same kind of punctures in the stalks as were made in the vines in the insectary, but in much less numbers. None of the punctures or slits at this time contained eggs.

On May 31 the first larva, a grub about one-eleventh of an inch in length, was found.

On June 1 eggs of the weevil were to be found in large numbers in the potato vines in the College plots.

LIFE HISTORY.

The period of oviposition commences about the first of June. This however, will vary with the different years. The female adult first makes in the stalk a small slit about one-twelfth of an inch long, in which she deposits one egg. In the same way, eggs are deposited in the main and secondary branches. In from seven to eleven days the small larva or grub hatches out and commences to work its way downwards towards the root of the stalk. As the larva is very minute at this stage, its channel is correspondingly small, and would scarcely be detected but for the dark colored warm dust within it. The larva is a voracious eater, and as it develops in size its tortuous channel becomes larger and more conspicuous. After channeling down a distance, the larva turns around and commences to enlarge its old channel, for at least a part of the way. It is this mining of the pith and wood by the several larvae in the stalks and branches that impairs the vitality of the plant.

FIG. 12.
Potato stem injured by a larva of the stalk weevil.

The latter part of the larval life history is best seen in that specimen which has reached the root. This larva, having bored for a distance into the root, generally as far as the diameter of the pith will allow, turns around and begins to enlarge the lower portion of its channel. In time the greater part of the pith extending to or a little above the level of the ground is completely mined, scarcely anything being left but the wall of the woody ring filled with worm dust and fibrous shavings. Just before pupating the larva ascends towards the top of this enlarged portion of its channel and bores a hole outward through the woody ring, but does not perforate the bark. Having done this, the larva now retreats back into its channel and places one or two plugs of fibrous shavings between itself and the opening just made. It then constructs a cocoon of fibers in which it pupates. The pupal stage lasts from eight to eleven days. By July 22 a large number of the larvae had pupated and by August many were complete beetles, in which stage they passed the winter, remaining within their host plants till spring, when they made their way out from the plants through the holes previously made for their escape by the larvae.

The distances to which the larvae channel vary. One specimen in a potato vine had worked down the stalk seven and one-half inches, and had pupated one and one-half inches below the point where the egg was deposited. The latter part of its larval life was spent in the first three inches of the channel. This portion was entirely cleared of its pith. The entire channel was filled with worm dust and small fibers. One larva, from an egg deposited in one of the main branches, had channeled downwards twelve inches and pupated in the main stalk about five inches above the level of the ground. In another case, a specimen in a ground cherry commenced to channel at about the level of the ground and burrowed downwards one inch, and then worked upwards two inches above the point where the egg was deposited. One larva from an egg deposited four inches above the surface of the ground burrowed into the root three and one-quarter inches below the level of the ground, and pupated one inch below the level of the ground. In the potato vines quite a number of the larvae did not attain maturity, particularly those from eggs deposited in the upper part of the vines. Often larvae injure a branch to such an extent as to cause the destruction of the less mature larvae farther up the same branch.

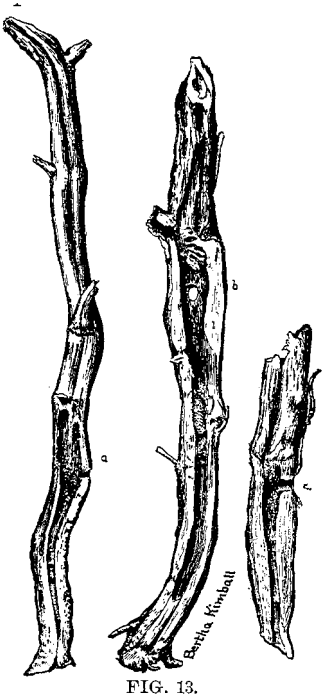

FIG. 13.
Work of the larvæ in potato stalks. *a, b, c*—Holes made by the larvæ for the escape of the adults.

In the ground cherry the larvae seemed to be more numerous, and had a tendency to collect in larger numbers in the main stalk. It was no uncommon thing to find as many as eight larvae in one stalk.

REMEDIES.

From what has been given concerning the life history of the stalk-weevil, it will be remembered that the adult passes the winter in the same plant in which it has gone thru its transformations.

FIG. 14.
Sigalphus curculionis (adult) in channel of stalk-weevil.

Possessed of this knowledge a most simple and effective remedy naturally

suggests itself, i. e., to collect and destroy all potato vines after the crop has been removed. The sooner the crop is gathered the better; for if the vines are left too long there is danger that many of the vines will have rotted, leaving the root, together with one or more weevils, in the ground.

There are certain weeds very common to this state, which are of themselves a great nuisance, aside from being a most prolific source of infestation to adjoining potato fields. These the potato grower should learn to recognize. Figs. 3, 4, 5 and 6 will greatly aid in their identification. In the fall, these weeds should be pulled up with a good portion of the roots, and destroyed. If pulling them should be too expensive an operation, the weeds should be cut down while young and allowed to dry up. By this means many of the immature larvae will be destroyed for want of proper food.

Care should be taken to promote a vigorous growth by clean cultivation and fertilizers. A healthy vine does not suffer so severely from the attacks of the pest. The greatest injury is seen in those vines of low vitality which have suffered from the attacks of other insects, heat and drouth. This was most evident from the experiments carried on this past summer. The plots that were either mulched or irrigated yielded by far the greatest returns, notwithstanding the fact that the percentage of infested vines in these plots was about the same as that of the other plots.

SPRAYING.

From the observations made in the insectary it was noticed that the weevils did considerable damage by eating into the stalks and branches, as will be seen in Fig. 11; in some instances so weakening the branches that they were not able to support the weight of the foliage. The vines in the insectary were sprayed with successful results. Spraying was tried in the College plots for both the weevil and the flea-beetle, but owing to the continuous rains it was impossible to determine the value of the experiment. This will be tried more fully this coming spring. When the weevils appear in large numbers upon the potato vines, we should advise spraying the vines with either London purple or Paris green, taking care that the stalks and branches are reached by the poison.

USE OF NETS.

In a small plot of potatoes, good results can be obtained by sweeping the vines with an insect net. It is not necessary to strike the vines hard, as the weevil has the peculiar habit of folding up its legs as if feigning death and dropping from the vines when

slightly jarred. Watch for the time when the weevils emerge: this can be ascertained by keeping through the winter a few infested vines in a closed receptacle. When the beetles emerge from these vines it is quite likely that they are to be found on the potato patch. Then is the time to commence to collect the weevils. The specimens that are collected can be killed by dropping them into a can containing kerosene.

The method of making a net we quote from Riley: "Make a loop of strong iron or brass wire, of about three-sixteenths of an inch in thickness, so that the diameter of the loop or circle will not exceed twelve inches, leaving an inch to an inch and a half of wire at each end bent at nearly right angles. Bind the two extremities of the wire together with smaller wire and tin them by applying a drop of muriate of zinc, then holding it in the fire or over a gas flame until nearly red-hot, when a few grains of block tin or soft solder placed upon them will flow evenly over the whole surface and join them firmly together. Take a Maynard rifle cartridge tube or other brass tube of similar dimensions; if the former, file off the closed end or perforate it for the admission of the wire, and having tinned it in the same manner on the inside, push a tight-fitting cork half way through and pour into it melted tin or soft solder, and insert the wires; if carefully done, you will have a firmly constructed and very durable foundation for a collecting net. The cork being extracted, will leave a convenient socket for inserting a stick or walking cane to serve as a handle." A bag should be attached to the hoop. It should be twice the diameter of the hoop in length, so that by giving the net a twist the mouth may be closed and contents secured.

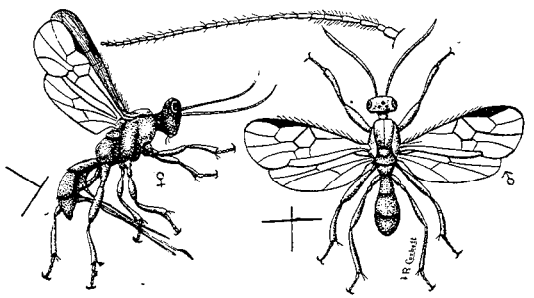

FIG. 15.
Sigalphus curculionis (adult).

PARASITE.

The larvae of the weevil are subject to the attacks of a small, black four-winged fly, known as Sigalphus curculionis, Fitch. (Fig. 15.) By means of her ovipositor the female fly deposits in the weevil larva a small egg, which in time hatches out into a small grub which feeds upon and ultimately destroys the weevil larva.

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