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THE IMPORTATION OF THE SAN JOSE SCALE, ASPIDIOTUS PERNICIOSUS, FROM JAPAN.

BY F. M. WEBSTER, WOOSTER, OHIO.

In *Entomological News*, Vol. IX., pp. 95-96, Mr. T. D. A. Cockerell states that Mr. Alexander Craw, quarantine officer at San Francisco, California, had "two or three times" found *Aspidiotus perniciosus* on trees from Japan, and, notably, on a plum tree that arrived January 25th, 1898.

On April 29th, 1898, the writer found *A. perniciosus* with *Diaspis amygdali* on Japan white semi-double Flowering Cherry, received direct from Japan during the winter of 1896-97, the trees having been planted out in an isolated locality during the latter part of April, 1897, and though having been growing in America for nearly or quite a year, their location was sufficient proof that they could not, by any possible chance, have become infested in this country. Only a part of the trees were infested, and these but slightly, the scale being more abundant near the surface of the ground and diminishing in numbers upward, while there were none to be found on the branches. The trees were small, being only about a half inch in diameter at base.

A lot of stock, belonging to the same varieties as those above mentioned, *Prunus pandula* and *P. pseudo-ceraceus*, that had also been imported directly from Japan and from the same firm, but during the winter of 1897-8, was then examined. Unlike the first lot, these trees had never been removed from the storehouse where they had been removed from the boxes in which they were imported. These trees were smaller than the others, having evidently been arch grafted, on older stock of some variety of cherry, by cutting off the original top and leaving a stump about six or eight inches in height and an inch or more in diameter, the cleft for the insertion of the graft being made after the usual manner, but instead of using a scion in the ordinary way, a young growing shoot of the flowering cherry had been inserted into the cleft at one side of the stump at the top, and the juncture covered with grafting

wax, the shoot, however, not being severed until after it had united with the stump, when it was cut off just below the juncture, thus greatly facilitating the growth of the graft, as it could draw its nourishment from the parent stock until it had firmly united with the new. These old stocks or stumps were much more seriously infested with the San José scale than the younger wood, averaging from one to six individuals to the square inch of bark surface, but extending upwards on the young growth well toward the extremity. On the old wood many of the scales were dead, but there were plenty of live ones and it was impossible to determine whether or not the dead had been parasitized, partly eaten by carnivorous enemies, or crushed in the handling of the stock, but that this was a direct importation does not admit of a doubt.

Mr. Cockerell thinks that the San José scale may probably be a native of the more or less elevated regions of Japan, the species of scale insects found there near the sea level seeming to belong to oriental tropical types. It was impossible to learn the exact locality where the stock examined by me had been propagated, but there were certainly no indications of immunity to the attack of this scale, though the trees might, perhaps, have withstood the attack better and survived longer, but, judging from all that could be observed from the actions of the scale on the importation of 1896-7, without the influences of natural enemies, it would spread as rapidly on a tree from Japan as it would on one from America, and this raises the question as to why, if it occurs in Japan, as it certainly does, this scale does not become as destructive there as with us in America. If this immunity is not due to resistive powers of the stock, and I certainly believe, from what I saw in these cases, it is not, then the protection must come from the influences of natural enemies, which is of itself the best possible proof that Japan is the native home of *Aspidiotus perniciosus*, and that we have a case parallel with that of the introduction of the Cottony-cushion scale, *Icerya purchasi*, into California from Australia. We have imported the San José scale and left behind its natural enemies that hold it in check in Japan, and while we cannot tell just what these enemies are, if the scale is a native of that country we have probably been importing it for years, and in that case, if the enemies were of a fungous nature, or internal feeders, we should have gotten them with their host insect long ago. It seems probable, then, that these enemies, or at least the one that is holding this scale in check, is one that is easily separated from its food and has for this reason been left

behind in the importation of fruit and ornamental stock upon which the scale has occurred. The overwhelming success that followed the introduction of the Australian lady beetle, *Novius cardinalis*, and the suppression of the Cottony-cushion scale might not again be repeated in the case of the San José scale, as, in case of a successful introduction of its natural enemies, its wide diffusion over the country would render its suppression much more difficult, but it would now seem that we have in our possession information enough to indicate very strongly that in Japan *Aspidiotus perniciosus* has natural enemies, which, if brought to this country and distributed in infested orchards and places where the scale exists, would sooner or later overcome this pest and hold it in check thereafter. We have accomplished this once and saved from ruin an immense industry, starting with even less prospects of success than we now have in the case of the San José scale. A competent entomologist located in Japan, for perhaps a year, would solve the problem, as within that time he would be able to study the San José scale and its enemies over a considerable area of country, and if such enemies were transmittible, and we have no reason to suppose that they are not, arrangements could be made to have them transmitted in quantity to the various Experiment Stations in this country in the States where the scale is known to occur. From a scientific standpoint, there does not appear to be a single significant obstacle in the way of again carrying out this plan of introducing from a foreign country the natural enemies of an insect that has been introduced with the plants upon which it depredates, while these natural enemies, owing to their habits, have been left behind.

Financially speaking, there ought to be no question as to the value to the country of the benefits to be derived from this importation, in case it is found to be practical. Even if it should fail, which must be reckoned among the possibilities, but not by any means among the probabilities, the financial loss would be but a mere bagatelle for either Canada or the United States, or even a single State, for that matter.

The total expense of sending Mr. Koebele and myself to Australia (See reports U. S. Commissioners to Centennial Exhibition at Melbourne, 1888, p. 78) in 1888-89, exclusive of salaries, was exactly \$1,694.97. With \$2,000 or \$2,500 at his disposal, an entomologist would be able to accomplish all that I have indicated, provided, of course, that he was already a salaried officer and his pay was continued by the institution with which he was connected. There are two widely separated town-