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Could the Widespread Use of DDT be a Disaster? ¹

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By popular report, the potentialities of DDT as an insecticide are so great that it is postulated that its employment may result in the termination of most of our insect tribulations. Such scientific investigations as have as yet been possible hardly support the sweeping claims of the popular articles, but they do point to a very real danger, if the reported results of one moderately large "field" experiment approach accuracy.

It has been stated that, in Pennsylvania, the treatment of a 20-acre tract of forest-land with DDT resulted in the almost total destruction of many forms of insect life in this area. If there is any truth to this statement, it would appear to be most fortunate that the experiment was limited to 20 acres.

The factors which maintain the equilibrium between the abundance of the vast majority of plant-feeding insects and their predatory and parasitic insect enemies are so delicately, and yet so satisfactorily, adjusted that man is in serious danger of producing disastrous consequences for himself if he attempts to interfere, other than to a very limited extent, with the "centre of balance." If he succeeds in deflecting it seriously, the "rebound" is liable to be very unpleasant, if not disastrous, for him during the next few years.

In this connection, it must be constantly borne in mind that the correct *density* in population, both of host and of parasite, is as rigid a requirement of a stable equilibrium as is their *relative abundance*.

¹ See Conant, No Joy in an Insect-Free World. Ent. News, 55: 258-259, 1944.

Fortunately, the occasions on which man has found it to be necessary for him to make widespread and intensive attempts to assume the role of nature in maintaining some kind of an equilibrium normally occur only when vagaries in the weather have permitted a temporary swing towards the super-abundance of some particular insect which is detrimental to his interests.

Such attempts as he then makes to reduce the surplus are all to the good since, to a certain extent, he is assisting in the re-establishment of a normal density of population among the host insects in addition to affecting a better ratio between their numbers and those of its enemies. Even at such times, however, it is owing to the fact that he has been only partially successful in exterminating the pest that its all-important enemies retain their ability to increase once more and, ultimately, to re-gain their ascendancy over it.

It is the unremitting decimation, by their enemies, of the hundred-and-one foliage feeding insects which inhabit every wood-lot that prevents each of them from becoming a pest of similar magnitude to other insects, such as the gypsy moth, whose only crime against the residents of America is the fact that it arrived in this Country minus its own complement of special enemies. Every native foliage feeder possesses just about the same potentialities for increase and destructive ability when it is given an opportunity to escape from the attentions of its ever-present enemies.

Fortunately, the complete elimination of any plant-feeding insect, by control measures, from small, more or less scattered, areas has little effect upon their subsequent abundance. Such small vacua are quickly re-invaded, not only by the plant-feeder itself but also by its enemies, and the slight "jolt" which may have been given to equilibrium in such areas is hardly appreciable.

Suppose, however, that the application of DDT to fairly large areas, such as several square miles, in connection with the control of some particularly injurious insect which was, at the time, occurring in outbreak numbers did result in the elimination of,

let us say, a dozen additional plant-feeders, all of which, when in a state of equilibrium with their enemies, are to all intents and purposes innocuous. It would matter little whether, at the same time, it directly killed their parasites as well as themselves. The elimination of their hosts for a single season would assure, in addition, as complete an elimination of the parasites unless some alternative host of sufficient similarity to their normal one to meet their requirements had somehow escaped the general devastation among the plant-feeders.

It could, however, be but a matter of a few years thereafter that the flying adults of one or more of these evicted natives, aided possibly by favourable winds at the time of their flight, reinvaded the cleared area from surrounding unaffected territory. It is almost impossible to visualize the possibility that a suitable number of their parasites, since they are on the wing at entirely different seasons of the year, will accompany them and thus be capable of re-establishing equilibrium without delay. Any which were unfortunate enough to re-enter the area at any time before the return of their hosts would, of course, "die without issue."

For this reason, any efforts which were made to eliminate a really injurious pest from a large area could not be relied upon to give permanent respite from it. Not only might they entail subsequent ultra-severe infestations from the pest itself but, at the same time, there is a very real danger that they would inaugurate temporary outbreaks of many another insect which, in so far as man is concerned, has always been in a sufficiently stable state of equilibrium with its parasites never to have occurred in sufficient numbers to constitute a menace of any kind.

Were this to occur, the only method man could adopt, unless he were prepared to accept and to live through the "outbreaks" which he had brought on himself, would be to repeat the treatment every few years thereafter. He would, thus, assume the laborious and expensive task of an annual reduction in the population of many an insect which, but for his interference, would have been assured, free of cost and human labour, by natural equilibria.

The regularly recurring outbreaks of the Forest Tent Caterpillar are due largely to the fact that, by the end of all such outbreaks, their parasites have become so excessively abundant that, in the year following the last in which the "outbreak" occurred, they caused a 100% mortality among the few survivors and, in consequence, they themselves are eliminated from vast areas. It is only in some subsequent year, when, from some area beyond the limits of the earlier outbreak, and where normal equilibrium has been maintained, some of the moths fly, or are carried by high winds, back into the freed area that we realize the tragedy of the fact that the earlier complete elimination of the pest resulted in an inevitable disappearance of its enemies. Very soon thereafter the caterpillar population has been built up to outbreak proportions and it is usually only after about three years of almost complete defoliation of the trees that the parasites, which are now able to reinvade the territory successfully, finally bring them once more under subjection.

In the meantime, to the obvious damage to the trees must be added the human discomfort of armies of countless hungry caterpillars which swarm over the countryside and are no respecters of houses, inside as well as out, in their search for food.

How much more severe troubles may man be storing up for himself if he employs DDT on a widespread scale and it approaches in effectiveness the claims which are made for it?

The place for its invaluable employment is surely confined to relatively small areas, such as the inside of 'planes or buildings or in gardens and orchards in which its use can not seriously affect the "balance of nature" throughout large tracts of land. It is somewhat gratifying to realize that its efficiency as a universal exterminator of insect life may prove to be somewhat less pronounced than many people believed it might be but, should it even approach its claimed toxicity to plant-feeding insects in general, its *widespread* employment over large connected areas might constitute an entomological disaster of the first magnitude.



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