

Pests of Tea and Methods of Control, with Special Reference to Cultural Practices*

by

D. CALNAIDO

T.R.I. Sub-station, Hantane, Kandy

ONE of the important factors that will contribute towards increased productivity will be the achievement of an increased margin between costs of production and income. Therefore it is important to view costs of operations in Tea from the point of economic returns. When viewed from this angle, the the past approaches to pest problems in Tea, with their over-emphasis on the insecticidal method, are very disappointing. In addition many of the current solutions to insect pests in Tea are tending to be uneconomic, particularly when viewed against the background of increasing costs and its foreign exchange component. This necessitates a revision of approach with due consideration of the principles of pest management and economic crop production. In my address I will attempt very briefly to outline our present approach to pest problems in Tea, and the orientation of research in this sphere, focussing special attention to the need for the ecological approach to pest management, with the emphasis on the use of bio-cultural methods as opposed to the insecticidal methods.

For the sake of lucidity, essential differences in the insecticidal approach to “pest control” and the bio-cultural approach to “pest management” are tabulated below, although the subject is by no means, as simple as it would appear from this tabulation.

PEST CONTROL (insecticidal)	PEST MANAGEMENT (bio-cultural)
<i>Aim</i>	<i>Aim</i>
1. Destroy the insect with use of insecticides	1. Ecological study of the <i>Crop</i> and the <i>Pest</i>
2. To prevent all damage	2. To regulate pest populations
3. To protect the plant	3. To prevent economic loss of <i>Crop</i>
4. ‘Increase’ the yield	4. Production <i>not</i> protection

* Text of a talk given at a Panel Discussion on “Crop Protection—current trends in Insect Pest Control” at the 27th CAAS Annual Sessions (1971), held on 15. 2. 71.

PESTS OF TEA AND METHODS OF CONTROL, WITH SPECIAL REFERENCE

Associated with

1. No proper attention to the ill effects of the insecticides on environment
2. No proper attention to long term economic benefits

Results

1. Less safe
2. Less effective
3. Less economical

Associated with

1. A study of the consequences of all methods used on the environment
2. A study of long term economic benefits

Results

1. Safer
2. More effective
3. More economical

2. *The chemical approach to 'insect control'* essentially works on the principle that the necessary benefits of protection and therefore increased production which is expected to follow from protection, will result by finding the right poisons, in the right dilutions to be sprayed over the pest and its food. The immediate destruction of the pest invariably a significant reduction in population numbers (not the quantum of population reduction, and therefore the reduction in the quantum of damage to the crop, which should be reflected in increased production in the long run) was taken as the criterion of essential benefits to the crops, an assumption which very often when properly evaluated could be quite erroneous in the long run. Today, having experienced the many problems resulting from the the insecticidal approach, there is an increasing effort to escape from the emphasis on the chemical cures to pest problems.

3. *The bio-cultural approach to 'pest management'* is based on the science of Pest Ecology, and works on the principle that the best means of preventing insects from becoming injurious to economic crop production, are those based on an understanding of the relationships between the crop and its environment, and the population dynamics of the pest insect species, and is associated with intensive efforts of long term research on pest ecology, whereby we are in a position to understand the various factors that interplay in the increased or reduction of pest populations (and also the populations of the beneficial insects) so that we are then in a position to adopt safe and effective methods that will reduce pest populations to levels that will result in economic pest control in Tea.

The above account very briefly summarizes the salient differences between the two divergent approaches to pest problem in Tea. It will not be possible to discuss here in detail all aspects of the ecological approach (Calnaido, D., (1971b), *T.Q.* 42. in press), and I will now confine myself to only some of the important aspects of our current thinking.

In an ecological approach, *the crop and the pests* will have to be studied in relation to their environment.

4. *The Crop:-* The ecological aspects of the crop-Tea-has special significance in pest control. Tea is a unique crop in this respect, in that, it is a tropical, perennial crop, grown in extensive monoculture, with a high frequency of vege-

tative harvest, over a long period of time, two to four year cycles. Moreover, it is also a crop that is used for the production of beverages, so that insecticidal residues even so slight, can not only influence flavour, but also become very important hazards from the angle of public health. Pest damage has a somewhat different significance on a vegetative harvest than on a harvest of fruit or seed. In the case of the latter the damage caused to the crop is direct and more easily assessed, in that the harvest is comparatively short-timed, whereas in the former, in consequence of the harvest being more or less continuous, over a long period of time, (as it is in Tea), a loss of crop at any one time may not necessarily be injurious, or even if so, have a comparatively insignificant effect on total yield returns of the whole pruning cycle. We have now found this to be the case in many instances resulting from the insecticidal control of shot-hole borer, tortrix and even mites.

Another very important ecological aspect of the tea crop is that there is considerable evidence that the beneficial parasitic insect population in Tea, of which we still know very little (and this calls for intensive research of this vital aspect), is a very important, safe and most economical means of natural pest control we can think of. One beneficial aspect of the sad episode of dieldrin spraying on Tea was to highlight the above aspect of natural insect control in Tea. On the other hand extensive monoculture of Tea causes adverse effects of insecticidal sprays to become more severe.

5. *The insect pests of Tea*

Of all the insect pests of Tea the most troublesome are shot-hole borer, tortrix, mites and perhaps termites, with localized distribution. To-date intensive research on population ecology have been done only on shot hole borer, where a continuous study of ten years is now beginning to produce information of very significant practical value, not only of the shot-hole borer itself, but also on tea pests in general. We now know that the growth of Tea from the prune; the growth of borer populations; the damage caused of and the patterns of yield in the pruning cycle, follow much similar trends, that it has misled many into believing that more than marginal, if any, yield increases follow shot-hole borer control, with the methods used at present. This has led us to look for alternative cultural methods of control, and research in this direction is now in progress. Similar long term population ecological studies of tortrix mites and termites are called for if we are to obtain a better understanding of how to regulate their numbers so as to succeed in economic pest control, oriented towards production and not protection.

6. **Methods of pest control**

6.A. **Insecticidal method**— I will not deal with the insecticidal method, except to point out how this method of pest control hinders the bio-cultural approach to pest population management.

6.A1. The natural control of the pests, particularly a pest like tortrix, would be restored more quickly if the process of the parasitic infection are not delayed by the applications of insecticides, thereby destroying the establishment of effective parasitic insect populations. Since it has been found that the loss of crop due to tortrix infection is of short-term duration only and that in the long run tortrix infestations do not cause economic losses of crop, it will be advisable to re-think our strategy on tortrix pest control.

- 6.A2. The initial distribution of pest by insecticidal applications, which appear to give short term spectacular results, in the long run leads to chronic situations of pest occurrences, calling for repeated applications of insecticides, resulting not only in high costs, but also causes the rise of other pest strains resistant to the insecticides. An added hazard of such repeated use of insecticides is that they can cause the destruction of beneficial parasites of not only of the existing pest insects, but also of other insect pests, hitherto insignificant, but now made capable of becoming serious new pests. This was clearly demonstrated as an aftermath of dieldrin spraying in Tea.

7.B. Bio-cultural methods

7.B1. The use of parasites and pathogens

When one talks of biological control it is often taken for granted that a new parasite or predator be introduced. While this is in itself good it is more important to study the existing parasitic populations, if any, and examine ways and means to enable them to become effective, if necessary by removing any possible limitations existing in the environment. This calls for studies on the insect parasite complex in Tea.

- 7.B2. **Selection of clones** is very useful, effective, safe and economical method of dealing with pests. However, selection of clones of insect pests of tea have so far been done only in respect of shot-hole borer, where some very good resistant clones have been found. (Calnaido, 1971a). Similar studies for mites and other pests could be usefully undertaken.

7.B3. Cultural practices

One of the more simple but very important and effective method in the long run, will be to explore the conditions of the crop environment which is our extensive monoculture of Tea, so as to create conditions more favourable for the insect populations. This may be achieved by the planting of trees, as boundaries or wind belts; providing reasonable cover of shade, where necessary; reservations of forest belts and grasslands and also by planting suitable ground covers. A comprehensive scheme of re-forestation (Forest Department, 1970) may in the long run be both very effective and economical too, and may be the best method of environmental manipulation, so as to encourage the predator/parasite/pest complex, to our advantage.

The effects of cultural practices in Tea such as shade, pruning, plucking, fertilizer and weeding applications, etc. in some measure affect insect populations. These have to be studied so that an understanding of these can enable us to alter or modify the relevant practices so as to bring about a regulation of insect pest numbers to uneconomic levels. Crop sanitation, as a cultural method, has been found to be an important means of regulating pest incidences, which will warrant particular attention.

7.B4. How insecticides could be fitted into the ecological approach

Insecticides themselves should be treated as instruments of environmental change. Insecticides are very useful in experimentation on crop losses due to pests. But before they are recommended for use, a complete study of all aspects effecting their use (i.e. economical aspect, health aspect, side effects, etc.) should be undertaken, and the benefits from their use should justify any side effects, however small they are likely to cause on the environment. (Here, I regret to mention that the thinking often appears in reverse: one is asked to prove why a particular insecticide should not be used). There is no insecticide that does not cause some small measure of adverse effects on the environment and therefore the use of insecticides should be only as palliatives, in special circumstances, and also to take care of outbreaks of pests. For these above reasons, and after evaluating all available experimental records, our current thinking is to discourage the use of insecticides in Tea, and their avoidance as far as possible.

Conclusion

Today all over the world in the field of economic agricultural entomology the emphasis in research is on the development of bio-cultural techniques. A detailed examination of past approaches on pest problems in the tea crop, particularly in its present socio-economic position, reveal the need to intensify our research on the pest ecology of Tea, with the hope of finding new, effective and economic bio-cultural means of regulating pest population, to replace some of the now existent chemical methods of pest control: so that we cease to think of "pest control" for mere protection and endeavour to regulate pest populations, by a system of pest management, utilizing all appropriate techniques of manipulating the bio-environment of our tea crop, with increased productivity as our goal.

References

- CALNAIDO, D. (1971a). Differences in susceptibility of tea clones in Ceylon to the shot-hole borer beetle, *Xyleborus fornicatus* Eichh. (Coleoptera : Scolytidae). *Angewandte Entomologie* **8**, 300—307.
- CALNAIDO, D. (1971b). A fresh approach to pest management in Tea. *Tea Q.* **42**, (in press).
- FOREST DEPARTMENT, CEYLON (1970). Notes on the planting of forest species Mimeographed. 26 pp.