Methods to be adopted to Maximise Production and Development of Improved Strains and Plant Materials — the Part Entomologist can Play *

By

SRI V. THIRUMALA RAO
Government Entomologist

It appears peculiar that an Entomologist should be asked to contribute a paper on the above subject. He has no method to be adopted for production and development of improved plant materials. He cannot also make any direct contribution for maximising crop production except when bee colonies can be utilised to increase yields and the only part he can probably play is to check the minimisation of production due to pests. It is in this that the Entomologist can be admitted to have his say in the subject chosen for the symposium at this Conference.

For my purpose the title reduces itself to one of safe-guarding Improved Strains and Plant Materials while in the process of maximisation of their productions. Insects are not respectors of materials produced with varied scientific talents. They do not make any difference between an improved strain or plant material and their local cousins unless the material evolved is so designed either to avoid them, resist them or even tolerate them. Evolution of insect – resistant varieties of plants though not directly concerning an Entomologist, will form a line in which he may be expected to play some part. The work will consist in the discoveries of varieties or strains of plants which display high resistance to insect attack and exploitation of the discriminative capacity on the part of the insects to select one variety in the preference to another. Apple varieties resistant to the woolly aphis (Eriosoma lanigera) and cotton varieties resistant to jassid and a few other similar instances are often claimed to have been evolved with varying degrees of success but absolute and perpetual resistance in any case remains only an ideal. Leaving aside this scientific achievement as of occurrence only in a few cases. the subject to be dealt with is nothing more than Plant Protection in Entomology if the garb is removed and pointedly examined, special importance being given to preservation of nucleus stocks of grains or plant materials produced as distinct improvements over the locals. In a country where agriculture is the main profession of the majority of inhabitants there will exist some local practices for the control of pests that damage crops. It is quite necessary to have a comprehensive view of these indigenous efforts to see in what all directions and to what extent it had developed and what more is to be done with the latest methods

* Paper contributed for College Day & Conference 1952.

available. The survey of indigenous methods shows that a fair use was being made of mechanical methods like hand-picking, basketting, pruning and digging out burrows etc. As we dive deep into this subject of agricultural practices and their bearing on the avoidance of insect pests, one cannot but admire the South Indian cultivator. The chemical method was practically confined to the use of arsenic as stomach poisons against rodents and Acorus and Tobacco as contact poisons. There existed a fair knowledge in the use of deterrents like camphor, copper sulphate, asafoetida, garlic, neem oil cake and leaves, tobacco, ash, lime, kerosene, tar and leaves with strong aroma like Ocimum, Gynandropsis etc. There were no effective fumigants in use and the biological control was confined to use of perches for birds, and driving in of ducks in Spodoptera – infested fields to clear them In grain storage, maximum use was made of sun-drying and pitting of produce for curing and avoiding insect and fire hazards.

It is with the above background, that Economic Entomology had its birth in this State in 1912. During the first decade, considerable pioneer work was done in establishing Entomology as Science and careful systematic study of insects in general and economic plant associates in particular. Till the year 1943, efforts towards creating an economic turn for Entomology yielded limited results in popularising mechanical measures for cutworms, hairy caterpillars and other pests, use of arsenates against tobacco and brinjal pests, tobacco decoction and Fish Oil Rosin Soap against soft bodied sucking insects etc. Biological control against the coconut caterpillar (Nephantis serinopa), the fluted scale (Icerya purchasi) and the woolly aphid (Eriosoma lanigera) in the Hills was also well established. It was in the year 1943 that fumigation method was brought into large scale use for treating infested foodgrains and this formed the first land mark in our progress towards effective and large scale application of pesticides.

It can be said that the introduction of BHC (Benzene hexachloride), DDT (Dichloro-diphenyl trichloroethane) and Zinc phosphide into the State for large scale uses almost synchronised with the starting of the Plant Protection Scheme and since then the Entomological activities of the State Department have proved really useful and economical to the toiling peasantry and won recognition from the public. We have now effective remedies for most of the pests and it is only the internal feeders, the coccid group and some of the hairy caterpillars that are still defying us. The Entomologist had to replace most of his old and ineffective stomach and contact insecticides and take to chemicals of complex nature with varying action on insects of even the same type of mouth parts. There is combination of actions of a stomach poison, contact poison, deterrent and even a fumigant sometimes in these pesticides and the chemical control had to be reorientated and adjusted with these drugs of great potency, now synthesised and available for ready sales at fairly

cheap cost. These drugs, however, did not prove to be an unmixed blessing and brought in their train the problems of phytocidal action, toxicity hazards and adverse effects on predators and parasites. The task of the Entomologist has thus been rendered highly technical and difficult as he has to make a judicious use of these drugs and adjust their dosage, bearing in mind their selective action and also their adverse effects mentioned above.

While we are consolidating our position with the wonderful drugs like BHC, DDT and Zinc phosphide, we have now reached a stage of further elaborating our efforts with purified BHC, HETP, Chlordane, Toxaphene, Parathion and Systemic insecticides like Schradan, Pestox etc. The purified BHC, known as Lindane and Hortex is devoid of the adverse effect of BHC in imparting bitter taste and flavour to vegetables and fruits and the phytocidal action against some plants. HETP is effective against both plant lice and mites and can be used as a combined spray when both exist. Since it has little lasting effct it can be used for tobacco and vegetables and fruits in bearing to avoid the residual effect in the harvested product. Parathion has proved to be the best insecticide for coccids (scales and mealy bugs) but on account of the toxicity hazard, has to be handled with care and only under conditions where absorption and retention by the harvested produce cannot be questioned. The systemic insecticides have given very encouraging results against plant lice, mites Penatatomid bugs, Tingids and certain coccids. As direct spray, these insecticides dot act on the insects but the active principle in them is absorbed by the plant, taken into sap and turned against insects that feed on the sap. Quite strangely the leaf eating insects that feed on the plants sprayed are not affected. The advantage in the use of systemic insecticides are (i) They are very efficient against some sap sucking insects and can act against them all when they are together. Hence the occurrence of plant lice and mites in company, which is common, can be dealt with together in a single treatment. (ii) Lasting effect continuous over a month and this is a great advantage as the plants treated can not only be freed of the pest existing at the time of spraying, but even helped to risist it over the coming four weeks, which is generally the period of occurrence for insects in a regular pest condition. (iii) These systemic insecticides do not affect the predators and parasites of pests and consequently their use does not at all interfere with the "balance of life", nature is always attempting to maintain and the "enemy" factor is not interefered with. (iv) Even a light spray on the plant is enough and careful spraying to cover the pest or the plant is not necessary. This secures a provision against careless work at spraying by the labour engaged. These insecticides are however, to be handled with care and crops sprayed can be harvested and used only after about six weeks after spraying. With these developments in synthetic insecticides the indigenous drugs like tobacco, Acorus, Thevetia, Lobelia, Tephrosia etc., are

not only unable to compete but even to establish as satisfactory popular remedies with ryots. Even tobacco which had established before as a common home-made contact poison is losing the ground now. Incidentally, the scope for the development of plant materials for control of insects thus appear to be limited to the extent indicated.

We have now many ways of storing grain free from insect damage. DDT, BHC or Paradichlorobenze are being used for seed storage. Surface dusting of bags with DDT or BHC can be freely done to keep off to a great extent insects infesting grain. Infested seeds excepting Oilseeds, can be fumigated with HCN (Hydrocyanic acid gas) and the grain that gets surface dusting of DDT or BHC or even fumigation with HCN can be used for human consumption. Zincphosphide baiting, if carefully and systematically undertaken, can eliminate rodent trouble in our stores. In spite of the availability of these wonder drugs, it will be an inexcusable matter if, in our present state of food shortage in South India, leakages are allowed to occur through agencies like insects and rodents. The latest methods of seed storage should be put to the maximum use in maximising production of improved strains.

Regarding storage of plant material, DDT can be used for storing of potato, sweet potato, turmeric etc. and special products like Geigy 33 - A. 5 - are available for the purpose. For materials that are to be used for seed purposes, there should be no objection to the use of such materials, leaving aside the controversy about DDT toxicity, as they contribute a good deal to prevent deterioration, while in store, of valuable materials under production. There is also advantage in fumigating and making seedlings and grafts pest-free before they are planted or supplied to the public. This prevents dissemination and transport of notorious pests and also helps the plant to have a healthy growth free from pests in its new life after transplantation. I may also add that it is better to get fumigated and certified all materials intended for local introductions or at least treat them with a fumigant as early as possible after their arrival. Plant introduction, if freed from their foreign pests and diseases, are sure to have particular enhanced value and use to the country.

The plant protection service has now taken to popularising pre-treatment of seedlings like paddy, chilly, onion, tobacco, brinjal, etc. with BHC - wettable solution (for the first four) and DDT - wettable (for the last) either in the nursery before the plants are lifted or during time of planting and this precautionery measure has given encouraging results wherever it was used in warding off pests in the fields for a long time and securing healthy growth for the young transplants. This should be freely availed of in maxmising production of improved strains. I have also to add that what are not serious pests to grown up trees are sometimes serious to young plants. Under this category,

we have leaf eating insects like citrus caterpillars (Papilio sp), mango leaf weevil (Eugnamptus sp), scales and mealy bugs, mites etc. and they should be paid immediate attention and suitably dealt with as they otherwise interfere with the growth of young plants and even cause their death.

Lastly, the eradication of prickly pear by the Cochineal insect is still green in our memory and the use of insects to control weeds in planted crops as well as to clear the ground for planting of crops is another line through which the Entomologist can contribute for maximisation of production. To some extent, he can also help to increase production in crops and plants where the local honey bee can be pressed into service for effective pollination and consequent setting of flowers.

In conclusion, I wish to add that the maximisation of production of improved plants can be speeded up and helped by the Entomologists, if their units are allowed extended facilities, encouraged by further expansions and nourished to their full stature towards which the latest developments in Plant Protection can contribute not a little. May I appeal to the Public through this conference that the Entomologist has now changed his coat and in him you can find a contributor at maximisation of production, and a social worker who can make the humans and the cattle live more happily and that his services should be fully utilised?