

infection of the coccidian *Eimeria tenella*, the measurements of the resultant anaemia provided a more sensitive means of detecting the parasite than do observations on the growth-rate of the chicks. In *E. necatrix* infections, however, there is a marked reduction in the growth-rate accompanied by only mild anaemia and the infections may thus be readily distinguished.

A host animal may show resistance to infestation by parasites, and J. F. Michel showed that resistance of the rabbit to the nematode, *Trichostrongylus retortaeformis*, may be manifested by the elimination of the adult worms, by arrest of development of the worms at the third larval stage or by preventing a new infestation from becoming established. The spontaneous elimination of parasites from the host known as self-cure also occurs in sheep infested with the nematode *Haemonchus contortus*. E. J. Soulsby investigated the serological reactions which take place at self-cure using complement fixation, haemagglutination and Ochterlony agar diffusion precipitin techniques. The evidence indicates that at this time there is a marked immunological response and that the main antigenic stimulation is from substances released by larvæ undergoing the third moult.

The susceptibility of a host to infestation may be influenced by the presence of other parasites already established in the host, and the nature of the interaction between such intercurrent infestations was studied by J. E. D. Keeling in rats experimentally infested with *Nippostrongylus muris* and *Strongyloides ratti* and mice with *Aspicularis tetraptera* and *Trichuris muris*. The susceptibility of plant hosts to attack by animal parasites is different from that of an animal host, and differences between varieties of

chrysanthemum in susceptibility to attack by eelworms were discussed by H. R. Wallace. The behaviour of eelworms on the outside of the plant, the invasion of the leaves through the stomata and movement of the worms within the leaf were described. The evidence supports the theory that varietal variation in susceptibility is related to hypersensitivity of the leaf tissues to eelworm invasion.

The degree of host-specificity shown by a parasite may be important in the epidemiology of human disease, as in the case of a pathogen harboured by both man and his domestic animals. F. E. G. Cox posed the question, "Is *Balantidium coli* a zoonosis?" and presented data suggesting that this protozoan normally found in pigs is not, contrary to common belief, easily acquired by man except possibly in certain nutritionally deficient states. Another group of protozoans, the 'Limax' *Amoebae*, have frequently been reported as parasites of both invertebrates and vertebrates, including man, and they are also abundant in the soil. Although these animals are similar morphologically they show great differences in their physiology and micro-anatomy and these differences are reflected in the ecology of the individual species. K. Vickerman submitted evidence that some of these 'Limax' *Amoebae* are facultative parasites closely related to soil-occurring forms, whereas others are obligate parasites more closely resembling the Endamoebidae.

A group of short papers and demonstrations described the work in progress at the Liverpool School of Tropical Medicine, and these together with three other laboratory demonstrations concluded the meeting. The proceedings of this meeting will not be published in full. J. MAHON

GLASSHOUSE CROPS RESEARCH INSTITUTE

THE Glasshouse Crops Research Institute, Littlehampton, Sussex, held its annual open day on May 17, more than four hundred visitors attending. The laboratories were open for inspection during the morning, and many visiting research workers and growers availed themselves of this opportunity to see the work in progress and to discuss aspects of it with the Institute's scientific staff. After lunch, the director, Mr. F. W. Toovey, gave a brief report to the assembled guests and visitors on the development of the Institute over the past year and on future plans, and directed attention to some lines of work of particular interest and importance. During the afternoon a number of special demonstrations were arranged in the experimental glasshouses and mushroom sheds.

In the tomato-breeding programme undertaken by Mr. L. A. Darby, the introduction of the even-ripening character of the 'Stonor' varieties into two well-known standard varieties, 'Potentate' and 'Ailsa Craig', was shown. The object of this is to eliminate the ripening disorder commonly known as 'greenback'. A parallel breeding programme has produced plants which have the compact habit of 'Baby Lea' but with the truss, fruit size and shape, and the freedom from 'greenback' of 'Moneymaker', the best-known of the 'Stonor' varieties. The new types have yet to be tested for yielding ability, but it is

hoped they will prove valuable to the grower as a means of producing better quality fruit.

The main variety trials were concerned with the further evaluation of selections descended from hybrids with the compact-habit (short internode) 'Baby Lea' variety, and include some which have attracted a good deal of interest among growers. Some of this material is being subjected to wide screening on growers' holdings and experiment stations this year.

Of interest in connexion with the tomato-breeding programme and other work at the Institute was a demonstration by the statistician (Mr. D. Cooke) of the results of a survey carried out in 1959 of the varieties of tomato grown commercially. From a 10 per cent sample of growers seventy distinct varieties were recorded, the four most commonly grown, according to total acreage, being 'Moneymaker', which occupied 32 per cent of the 2,067 acres estimated to have been grown in Great Britain in 1959, 'Potentate' (17 per cent), 'Ware Cross' (15 per cent) and 'Ailsa Craig' (6 per cent). Within this general pattern, however, there were marked differences according to district and time of planting.

The Chemistry Department, under Dr. G. W. Winsor, demonstrated some aspects of its work on plant nutrition, composition and biochemistry. The nutrition trials now cover the tomato, carnation,

lettuce and early-flowering chrysanthemums, and the Department is closely associated with studies on bulb nutrition at the Ministry of Agriculture's Experimental Husbandry Farm at Kirton, in Lincolnshire. The special demonstration for the day was on the subject of carnation nutrition, the first experiment, extending over two years, having just been completed. This factorial trial, testing three levels of nitrogen and two of potash in the presence or absence of added phosphate, magnesium or calcium, making forty-eight different combinations of fertilizer treatment in all, showed a beneficial response to phosphate and nitrogen in terms of total flower production, and splitting of the calyces was more marked at low nitrogen-levels. A more complete assessment of the results will be possible when the numerous soil and tissue samples taken during the course of the experiment have been analysed. Visitors were able to see the second experiment on this subject which had just been planted; this is another factorial trial comprising four levels of nitrogen and three levels of potash supplied in liquid feeds, superimposed on four levels of phosphate and two levels of lime incorporated in the planting compost.

Other subjects dealt with by the Chemistry Department were the problem of manganese toxicity and the effect of soil salinity on plant growth. Symptoms of manganese toxicity had been observed on tomato, carnation and lettuce, and the disorder appears to arise when considerable amounts of soluble and exchangeable manganese are released from glasshouse soils sterilized by steaming. For the soil salinity studies a reliable and convenient method for the fairly rapid determination of salt concentration in the presence of sparingly soluble salts such as calcium sulphate, which commonly accumulate in glasshouse soils, is being sought.

The Chemistry Department is devoting a good deal of attention to studying the composition of tomato fruit. Rapid methods have been developed for the analysis of relatively large numbers of fruit samples, and much information is being accumulated on the relation between fruit composition and manurial levels, variety and environmental conditions. Special attention is being paid to the problems of fruit quality in relation to fruit composition, and it is hoped that the information being obtained will serve as the basis of an approach to the problem of fruit flavour. Although there is much still to be learned as to the primary cause of fruit disorders, such as 'blotchy ripening', it is clear that their development ultimately depends on some departure from the normal biochemical processes of fruit ripening. Studies of certain enzymic processes in tomato fruit have therefore been undertaken, starting with the pectic enzymes associated with the softening of tomato fruit during ripening. Limited exploratory work on the effects of ripening of certain enzyme inhibitors injected into tomato fruit is also in progress, the object being to gain some insight into the mechanisms by which rates of ripening are controlled in the fruit.

The environmental factors which influence ripening disorders in the tomato fruit have also been investigated by the Plant Physiology Department, under Dr. E. R. Leonard, and experiments were shown in which the effects of subjecting fruit tissues to different levels of temperature, while the plants remain at house temperature, were being studied with particular reference to fruit coloration.

Work on the growth of the tomato has been carried a stage further, and plants were seen growing in glass chambers in which the environment, including day-length, is partially controlled. Weekly measurements of roots, stems, leaves and fruit were being made on these plants, as well as daily counts of anthesis. In an accompanying experiment the relation between growth and development of tomato plants and the age of the plant and time of year was being further investigated, with special reference to the development of the first truss.

Work on virus diseases was a particular feature of displays by the Plant Pathology Division, under Dr. L. Broadbent. A number of diseases of flowers and ornamentals which are being studied were demonstrated, as well as attempts to free stock plants of chrysanthemum and carnation from virus diseases by heat therapy or meristem culture. The investigation of tobacco mosaic virus on the tomato, a serious problem to the grower, has been intensified, and several critical experiments on various aspects of the problem were in progress. Special attention is being paid to the sources of infection in commercial glasshouse practice, and experiments are being carried out to determine the relative importance of seed, infected residues in the soil, infected structures and tools, infected clothing and smoking tobacco. An attempt is also being made to assess the loss from infection under glass, using a moderately severe strain of tomato mosaic virus inoculated into two varieties, 'Potentate' and 'Moncymaker', at three stages in plant growth. The experiment was planted in mid-February, and by the open day there were marked differences in growth and fruit set between early-infected plants and the remainder, all the inoculated plants being still healthy.

Also within the programme of the Plant Pathology Division was a demonstration of the work on the 'watery stipe' disease of the cultivated mushroom, undertaken in the Mycology Department under Mr. P. H. Williams. Recent experiments have shown beyond doubt the transmissibility of this disease, and the infective principle in a diseased mycelium, which is always characterized by abnormally poor growth, can be passed to a healthy one simply by growing the two together. The further finding that infectivity can be eliminated from diseased cultures by a process akin to heat therapy raises the intriguing possibility that a virus may be responsible for the mushroom disorder, and virological techniques are being employed with the view of finding out if this is so.

Other work on cultural aspects of the mushroom is undertaken by the Horticultural Department under Mr. G. F. Sheard, and specially constructed chambers for studying the effect of environmental conditions on fruiting and development of the mushroom were on view. In these chambers, of which there are eight, each with 4 sq. ft. of growing area, temperature, relative humidity and ventilation-rate can be varied independently.

Among crop protection problems under study was a comparison of chemical soil sterilizing agents, including the newly introduced metham-sodium (sodium methylthiocarbamate), with the traditional steaming method. This experiment has shown that on a soil free from serious soil-borne diseases, yet needing sterilizing to restore fertility, chemicals can be as effective as steaming, treated plots giving about a 20 per cent increase in crop over the untreated controls. The long-term effects of repeated applications of

chemicals need to be studied, however, and the distribution of the chemicals in the soil, their breakdown and possible phytotoxic effects are being investigated in the laboratory.

The problem of resistance to acaricides shown by the glasshouse red spider mite (*Tetranychus urticae* Koch), which is assuming serious proportions in the Lea Valley on cucumbers, is being tackled as a co-operative project by the Crop Protection Department,

under Mr. W. H. Read, and the Entomology Department, under Dr. N. W. Hussey. This work involves the testing of Lea Valley strains of the mite for cross-resistance to other acaricides to assess the practicality of increasing the range of materials in use. This is to be followed by large-scale trials later this year to investigate control of the pest by physical and biological agencies to which it is unlikely to develop resistance.

F. W. TOOVEY

SCIENCE TEACHING IN SECONDARY MODERN SCHOOLS

SERIOUS deficiencies in the provision of science teachers, laboratories and science equipment in many secondary modern schools are revealed in the results of a survey carried out by the Science Masters' Association. Three-quarters of the nation's children attend secondary modern schools, yet in many of them serious shortages are revealed. Many schools returned the questionnaire stating that they provided no teaching in science, 73 taught no science because there were no teaching facilities, 33 because there were no teachers available who were capable of teaching science.

The material on the survey was collected from more than 1,500 questionnaires. The return compared with a total of about 3,700 schools of this type existing in 1958; the investigation was conducted throughout by the Secondary Modern Schools' Committee of the Science Masters' Association.

The Committee believes that there should be one laboratory for each 300 pupils in the school, two for schools of 301-600 pupils, and three for those of more than 600. The survey states that on investigating the conditions under which science was being taught

in secondary modern schools, 47 per cent are obliged to teach all or part of their science under unsatisfactory conditions.

The investigation revealed that only one science teacher in six in a secondary modern school is a graduate, while about one in six has "no pretensions at all to science qualifications". Only 34 per cent of the schools considered that they were adequately staffed for teaching science. Special account is taken in the survey of head teachers' opinions on the most important needs to improve science teaching. Their orders of priority are more science teachers, more laboratory accommodation, and more equipment.

The statistical return suggests that, in 65 per cent of the schools concerned in the survey, more science staff are needed. The booklet comments: "It follows that in the country as a whole no fewer than 2,500 schools need science teachers and in some cases more than one teacher will be required".

Copies of the booklet are available, price 1s., from Mr. D. M. Chillingworth, The Village College, Swavesey, Cambridgeshire.

SCIENTIFIC RESEARCH IN EAST AFRICA

JUST over half the annual report of the East Africa High Commission for 1959 deals with the East African Research and Scientific Services, on which some £706,466 was expended, with a further £212,962 on the Desert Locust Survey, £270,812 on the Meteorological Department and £470,645 on the Directorate of Civil Aviation, out of a total recurrent expenditure in 1958-59 of £3,907,933, towards which £567,863 was received from the United Kingdom Government in Colonial Development and Welfare or direct Exchequer grants*. Some account of the work of these regional organizations, for example the East African Agriculture and Forestry Research Organization, the Veterinary Research Organization, the Fishery Research Organization and the Institute for Medical Research, was included in the reports published under the title "Colonial Research 1958-59", but no reference was made in that report to the curtailment of research programmes through the reduction of scientific staff at some of the High Commission's organizations in consequence of territorial financial cuts. The East African Agriculture and Fisheries Organization report, for example, refers to the reduction of the establishment of research

officers from 28 to 23 and of scientific assistants from 20 to 14, chiefly in the Divisions concerned with soil fertility, soil chemistry and soil classification, with the result that the Organization is not always able to co-operate effectively with the Territorial Departments. The Trypanosomiasis Research Organization also refers to reduction in staff, and the Meteorological Department has found the difficulty of recruiting staff from Britain to constitute a formidable obstacle in its programme of expansion. On the other hand, help is being received from the Rockefeller Foundation for agricultural research in East Africa, and the Nuffield Foundation is financing further research on the physiology of drought resistance in crops, and on the improvement of the nitrogen status of tropical soils by suitable use of indigenous tropical legumes.

The work of the Agriculture and Forestry Research Organization has included work on the increase of crop-yields by reducing the damage done by pests and diseases, such as the study of 'stem pitting' of *arabica* coffee, a survey of the nematodes of the principal East African crops, the development of a strain of maize resistant to the virus disease known as 'streak', and also work on the effect of drought on the growth of plants and the water requirements of

* East Africa High Commission. Annual Report, 1959. Pp. iv + 100. (Nairobi: Government Printer, 1960.) Sh. 5.