Plant Protection in the Soviet Union

By R. C. Rainey

IN the course of a recent visit to some of the chief Russian entomological research centres, I had the opportunity of seeing something of the headquarters of the Soviet plant protection service, the All-Union Institute for Plant Protection, and also of seeing the Plant Protection Station for the Leningrad Province. In view of the attention which Russian agriculture has attracted in recent years—Vavilov states that the 1937 harvest has proved the largest in history—the following notes may be of general interest.

The more basic agricultural research in Russia is directed by the Lenin All-Union Academy of Agricultural Sciences in Moscow, controlling the work of half a dozen or more research institutes. One of these is the Institute for Plant Protection; another is the Institute of Plant Industry, which has its headquarters in the former Ministry of Agriculture building in the Ulitza Gerzena, Leningrad (Fig. 1), and is directed by Dr. N. I. Vavilov, vice-president of the Academy, whose world-wide investigations into the origins of cultivated plants are now well known, and for whose assistance during the present visit I am particularly grateful.

VIZRa, the Institute for Plant Protection, has its administrative headquarters in the Ulitza Kras-

Fig. 2.

LABORATORIES OF THE INSTITUTE FOR PLANT PROTECTION, ELAGIN OSTROV, LENINGRAD.

naya in Leningrad, while most of the laboratories are housed in a small palace (Fig. 2), said to have been formerly the residence of Stolypin, Nicholas II's minister, on the Elagin Ostrov, an island in the Neva on the northern side of the city. The gardens occupying the remainder of the island now constitute the Kirov Park of Culture and Rest; a dance for factory workers was in progress in the former ballroom of the palace during one of my visits to the Institute. Something like fifty research workers, together with their assistants, are employed by VIZRa, which is subdivided into a number of sections dealing with ecology, biological control, chemical control, mechanization of control measures, pests of special crops such as grain and cotton, and so on; in the limited time available it was only possible to see a small proportion of the work in progress, even apart from the extensive field studies.

Dr. J. I. Prinz and his collaborators are investigating problems of soil ecology, working chiefly with the chafer beetles *Melolontha melolontha* L. and *M. hippocastani* F., and with the wireworms *Agriotes obscurus* L., confined to the northern parts of the Union, and *Selatosomus latus* F., a more southern species. Considerable progress has been made in the

Fig. 1.

INSTITUTE OF PLANT INDUSTRY, ULITZA GERZENA, LENINGRAD.

difficult task of rearing these long-lived insects under controlled environmental conditions; *Melolontha*, for example, can now be reared without soil from the beginning of the second instar, and its life-cycle is completed in 10–12 months in the laboratory, as compared with four years or so in the field. The optimum conditions for oviposition and for the larval development of *Agriotes* have also been largely worked out.

Dr. I. A. Rubtsov's laboratory is primarily a methodological one, investigating methods of studying the various factors influencing insect numbers. Many of the methods used are those familiar in Great Britain, but they do not appear to be applied uncritically; for example, sulphuric acid and a number of metallic salts are no longer used in the control of humidity, as they are stated to have injurious effects on the experimental insects. Associated with Russian climatic conditions, temperatures down to -20°C . are used in cold-hardiness work. Some interesting work is in progress on the rearing of phytophagous insects such as plant-sucking bugs under conditions of controlled temperature and humidity; large double-walled thermostatically controlled greenhouses are available for the experimental plants. Rubtsov has also carried out important work in Siberia demonstrating phase variation in non-migratory grasshoppers essentially similar to, though less pronounced than, the phase differentiation in locusts.

The biological control section is directed by N. F. Meyer, who has carried out a considerable amount of survey and taxonomic work on the parasitic Hymenoptera, while V. P. Pospelov is in charge of investigations in insect microbiology.

In the chemical control section, which includes the laboratories of insect toxicology, oil emulsions, vegetable poisons, fumigants, and phytotoxicology, Dr. C. J. Bliss, the American statistician, has been working for the last two years on a contract with the Soviet Government; he has been carrying out a programme of theoretical and practical work on the application of statistical methods to entomological problems, with particular reference to the design of experiments for insecticide trials. A new type of spray testing apparatus, incorporating the ideas of Campbell and Tattersfield with modifications suggested by Bliss, and made by the Institute's technicians, has recently been supplied to several of the laboratories. A somewhat similar apparatus is used for laboratory trials of insecticidal dusts; leaves are dusted under controlled conditions in a special chamber, and standard disks of treated leaf are supplied to each insect. The concentration of dust on the leaves is determined by weighing similarly exposed cover-slips of known area on a micro-balance; the amount of dust ingested is determined from the area of leaf eaten, found by mounting the partly eaten disks on squared paper. The method is of course applicable only to stomach poisons. The staff of the chemical control section, like other Soviet workers whose duties involve handling toxic materials, each receive a free extra milk allowance of half a litre daily.

The Plant Protection Station (STAZRA) for the Leningrad Province is directed by Prof. N. N. Bogdanov-Katkov, who also holds a teaching post in the Institute of Applied Zoology and Phytopathology, at which plant pathologists and entomologists are trained. A visit was also made to the field station at Peterhof, about twenty miles out of the city on the sea-coast near Peter the Great's palace. Research is carried on in addition to the advisory work, and recommendations concerning new control measures

are circulated among the collective farms of the province. One such new control measure is the use of a naturally occurring hydrated ferrous phosphate to protect seed, particularly seed corn, from various stored products pests, particularly the flour mites *Tyroglyphus farinæ* DeG. and *Glycyphagus destructor* Schr., often associated with the predaceous mite *Cheyletus eruditus* Schr. The ferrous phosphate is found under the peat of the moors of Karelia and elsewhere at a depth of a foot or so; on air-drying, it falls to a fine blue powder which is used as a seed-dressing. It appears to act not as a poison but as a repellent, the mites dying after some weeks apparently from starvation.

The arsenicals generally used against orchard and vegetable pests are calcium arsenate and sodium arsenite and arsenate; the employment of lead arsenate is illegal, on account of the possibility of cumulative poisoning. The alkaloids aconitine and anabesine appear to be used to a considerable extent; another somewhat unfamiliar insecticide is chloric acid, used as a 1/10 per cent solution for the destruction of the eggs of the cabbage root-flies *Phorbia brassicæ* Beh. and *P. floralis* Fall., which cause considerable losses in the spring and summer respectively—cabbage pests generally are of considerable economic importance in this province. The staff of the Station appeared well informed on foreign practice; they were, for example, familiar with the proprietary organic mercury compounds used in Great Britain against smut (*Ustilago* spp.) on cereals.

The field station is chiefly concerned with the mass breeding of the Chalcid parasite *Trichogramma evanescens* Westw. for the control of a number of pests, particularly the codling moth, *Cydia pomonella* L., in apple orchards, and also the pea tortricids, *C. nigricana* Steph. and *C. dorsana* F. The parasites are reared on *Sitotroga cerealella* Oliv.; the stock culture of the latter is maintained in some three tons of grain.

The parasite was originally introduced from abroad, and the mass breeding work has been in progress for the last three years. A number of the collective farms in the province now breed their own *Trichogramma* for release; a peasant came in with a consignment of parasitized eggs from his collective farm for cold-storage at the Peterhof laboratory during the visit there. 2,500 acres of orchards have recently been treated, the parasites being released at the rate of about 120,000 per acre. Complete control is not claimed, but experimental results showing, for example, a reduction in the proportion of infested fruit from 33 per cent in the control areas to 17 per cent in the treated ones were quoted. The results suggest a localization of the activity of the released parasites which does not agree with the rapid dispersion found, for example, with *T. lutea* Gir. in the Transvaal, though environmental differences, mainly perhaps in temperature, may be involved here.

In conclusion, one or two general points concerning accommodation and equipment may not be out of place. Though most of the existing accommodation is of a temporary nature—the Institute of Plant Protection is to follow the majority of the central scientific institutions to Moscow within the next few years—one's general impression was not unfavourable. Equipment was surprisingly good; microscopes, micro-balances, incubators, electric motors and relays, constant temperature rooms, calculating machines, and glassware of all kinds may be mentioned as examples of Soviet-made apparatus apparently fully up to the standard of that in use elsewhere.