

## FRUIT RESEARCH

**Bees should Work Harder**

by our Botany Correspondent

POMOLOGISTS at Long Ashton Research Station have recently had the rare good fortune to obtain results that could have an immediate impact on the yields of fruit trees. There need be no long drawn out trials before the benefits of their crash programme on pollination can be reaped in the form of more profitable management practice. The latest annual report from Long Ashton, the National Fruit and Cider Institute (price £1), tells how a joint effort by Long Ashton staff, growers and the National Agricultural Advisory Service revealed the striking effects of inadequate fruit set and pollination on the yields of apple orchards.

Sixty-eight per cent of orchards of Cox's Orange Pippin apples investigated failed to produce the estimated optimum number of fruits of acceptable market size, roughly 60–120 fruits per 100 clusters of blossom, depending on the size of the trees and other factors. In most cases all the fruit would have set if the blossom had been adequately pollinated. Not surprisingly another of the causes of the trouble has turned out to be frost, not only immediately after flowering, long known to be a period of high vulnerability, but also before blossom time. Many of the flowers of Cox that failed to set fruit because they had abnormal ovules were growing on sites subject to pre-blossom frost. On adjacent plots protected from frost by orchard heaters much more fruit set successfully. This work should yield immediate benefit in the form of advice for the planning of orchard heating schedules.

Others at Long Ashton have tackled the problem of pollination from the zoological standpoint. In the orchards of the station, bees—honey, bumble and solitary—turned out to be the most efficient carriers of pollen. Bumble bees continued their activity in duller and cooler conditions than other insects, and visited about ten flowers per minute, while honey bees only went to five flowers per minute. Bumble bees also flew from tree to tree more frequently than other pollinating insects, which included Nitulid beetles and small flies. Plans are afoot to mass produce some of the potentially useful insects, including bumble bees, whose populations are at the moment too small when fruit trees are in flower.

A new line of research at Long Ashton is how to produce more plums. The plum industry has been declining steadily, although Britain can produce very high quality dessert plums with good market appeal. The answer to the problem is thought to lie in the development methods for producing heavy, regular yields of the best quality plums and gages. The first prong of the attack will be a plum breeding programme.

## SUGAR

**Uses for Fructose**

from a Correspondent

THE clinical value of fructose emerged clearly at the international symposium on the clinical and metabolic aspects of 'Laevulose' (fructose) held at the Royal Society of Medicine on June 3 under the auspices of Laevosan AG and Calamic Ltd. Although it occurs

naturally in fruit and in honey, fructose has in the past been expensive to manufacture and of rather esoteric interest except to those dealing with certain clinical problems. Professor S. A. Barker (University of Birmingham), however, predicted that within a few years this sugar will be of great commercial importance, for current developments in the use of enzymes attached to solid polymer reactors will make it possible to produce cheaply vast quantities of fructose from wheat starch. Fructose might then rival sucrose as a food sweetener.

Professor I. Macdonald (Guy's Hospital) showed evidence suggesting that a diet containing carbohydrate in the form of fructose or sucrose (50 per cent glucose and 50 per cent fructose) has a greater tendency to cause an increase in plasma triglycerides than a diet containing starch or glucose. This evidence was challenged by Professor T. R. E. Pilkington (St George's Hospital), whose experiments suggested that total caloric intake and changes in weight are more important than the type of dietary carbohydrate in affecting triglyceride levels. In view of the possible association between high plasma triglycerides and arterial disease, and the prospect of an increasing amount of fructose in diets, it is clearly important that this conflict of views be resolved by further investigation.

Dr V. Marks (West Park Hospital, Epsom) emphasized the physiological importance of insulin releasing factors (such as glucagon and pancreaticozym) secreted by the small intestine in response to glucose and galactose. He showed that the insulin response to oral glucose was greater than to intravenously administered glucose, and whereas oral galactose is a potent stimulus to the secretion of insulin, intravenous galactose has no such effect. Fructose induces no secretion of insulin by either the oral or intravenous route. It is possible to speculate that the modes of absorption of these sugars have some relation to the effects on insulin secretion, for as Dr H. B. McMichael (Central Middlesex Hospital) showed, glucose and galactose share a common energy dependent transport carrier in the small intestinal mucosa. Fructose, however, is absorbed much more slowly and by a different transport process.

Professor E. R. Froesch (Kantonsspital, Zurich) reviewed the metabolic pathways of fructose, describing how in its transport into cells and reactions as far as triose phosphates, it is independent of insulin. This is in strong contrast to glucose, and explains the usefulness of fructose in the treatment of diabetes not only before insulin was discovered in 1921, but also in the treatment of some diabetic problems today. Froesch described experiments, however, which showed that insulin deficiency, by allowing an increase in the activity of gluconeogenic enzymes, causes greater conversion of fructose to glucose. This imposes a limit on its use in diabetics who are severely insulin deficient.

Dr S. P. Allison (University of Bristol) described a similar limitation on the use of fructose in the intravenous nutrition of patients in states of shock or acute illness in view of the hypersecretion of insulin and of adrenaline and corticosteroids, which occur in these conditions. But he emphasized its value in patients convalescing from injuries such as burns.

The value of fructose in limiting protein catabolism in patients with renal failure was described by Dr A. M. Paton (Western Infirmary, Glasgow), who also showed that it had the property, unique among the sugars, of accelerating the rate of removal of alcohol from the