RESEARCH ITEMS

Heterogeneity in Wheat Germ and High B_1 White Flour

IN a paper "The Vitamin B_1 and Riboflavin Contents of Wheat Germ" just published (*Chem and Ind.*, September 1942), J. J. C. Hinton has shown that the two fractions of wheat germ, scutellum and embryo, differ in physical properties. More important is the fact that their B_1 contents are very different, that of the scutellum averaging 40 I.U. per gram and of the embryo 4 I.U. per gram. The riboflavin values, on the other hand, are roughly constant at 15 γ per gm. This work is of fundamental importance in flour milling, and T. Moran in an article published in *Milling* (October 10, 1942), has shown its application to Canada-approved white flour and high B_1 white flours generally. Nutritionally the ideal white flour would appear to be one containing the full amount, roughly $1\frac{1}{2}$ per cent, of scutellum; the precise milling procedure necessary to obtain such a flour is a pretty problem in milling engineering. In dry milling, such as is now general practice in the milling of National flour, the scutellum adheres tenaciously to the adjoining endosperm and, therefore, probably finds its way into the finished meal. This is the explanation of the relatively high B_1, averaging 1·10 I.U. per gram, value of National flour.

Integument of Insects and the Entry of Contact Poisons

V. B. WIGGLESWORTH has recently published the results of some interesting work on this subject (*Bull. Entom. Res.*, **33**, 205–218; 1942). He deals in particular with certain structural and physiological features of insect cuticle and their relation to the entry of contact insecticides—in special extracts of pyrethrum in oil. It is found that, as a rule, insects immersed in oils exude minute droplets of water over the surface of the cuticle. Factors governing the rate of entry of pyrethrum through the cuticle have been studied by the application of this substance in oil to a restricted area of the abdomen of the bug Rhodnius. Entry is more rapid in light than in heavy petroleum oils, but is very slow in vegetable oils. There are great individual variations, due chiefly to the thickness of the endocuticle and other factors. There is also evidence that the pore canals are important in connexion with the passage of pyrethrum through the endocuticle. Histological examination of the integument shows that, in the nymphs of Rhodnius, oils are first taken up by the epidermal cells around bristles and later by the general epidermis. The uptake of oil is much increased by adding 5 per cent of oleic acid to refined petroleum. Among adult Rhodnius, soon after ecdysis, oils are taken up by the general epidermis, whereas in old insects they are taken up only by the dermal glands.

Parthenocarpy Induced by Frost in Pears

THE occurrence of frost when fruit trees are in bloom is generally regarded as detrimental if not disastrous. However, D. Lewis (*J. Pom. and Hort. Sci.*, **20**, 40; 1942) has shown that in some cases it may be instrumental in producing a crop. Among pear varieties, Conference and Fertility are usually regarded by growers as self-fertile, but indoor tests at the John Innes Horticultural Institution have shown them to be highly self-sterile. Outdoor tests under isolated conditions, on the other hand, resulted in the production of fruits by both varieties after self-pollination. The Fertility fruits were seedless whereas those of Conference dropped before full maturity. It was noticed that the styles of many of the flowers of the outdoor trees were blackened by frost at the time of pollination and it seemed likely that parthenocarpic fruits had been developed by the action of cold. This hypothesis was tested by keeping individual branches of potted trees at low temperatures from 0° C. to −9° C. for varying periods. Out of nineteen flowers kept at −9° C. for 18 hours, nine swollen fruits were produced, of which two reached maturity. These were good, well-shaped specimens, but contained no seeds and only traces of ovules. At other temperatures many fruits were produced but dropped in June before reaching maturity. It is concluded that cold stimulation may play a great part in maintaining regular bearing in some pear varieties. In a cold spring in which insects are not active to effect cross-pollination, a frost at the time of flowering, instead of doing damage, may be the making of a good crop.

Volatile Products from Apples

ETHYL alcohol, acetylene and ethylene are among the volatile substances known to be evolved from ripening apples. The latter is of considerable commercial importance because of its ability to initiate ripening in green fruits and cause injury to the skin of ripe apples. Other substances as yet unidentified are presumed responsible for the appearance of 'scald'. L. P. Walls (*J. Pom. and Hort. Sci.*, **20**, 59: 1942) has improved on the current methods of estimating these volatile products by using sulphuric acid, activated by the addition of 2 gm. silver sulphate per 100 ml. as an absorbing agent. Preliminary tests with a stream of air containing ethylene (1 in 10,000) showed that more than 90 per cent of the ethylene was absorbed. The condensable and odorous products from King Edward VII and Laxton's Superb apples were absorbed in a preliminary trap of ordinary sulphuric acid, which accounted for about one third of the total volatile products. Most of the remaining two thirds was absorbed in a second trap containing activated acid. This acid reacted quantitatively with chromic acid giving acetic acid in amounts agreeing with the assumption that the bulk of the absorbed substance was ethylene. It is concluded, therefore, that ethylene forms a high proportion of the volatile substances produced during the storage life of the apple. By the use of adsorbents, the production of volatile substances more readily condensable than ethylene and of possible importance in relation to scald was confirmed. Among these the acetic and formic esters of amyl alcohol were identified.

Auxin and Leaf-Protein

A NUMBER of hypotheses have been advanced concerning the substances from which auxin is released in the plant. S. G. Wildman and S. A. Gordon (*Proc. Nat. Acad. Sci.*, **28**, 217; 1942) have shown that proteolytic enzymes release auxin from the proteins in the leaf of spinach. Proteins from both cytoplasm and from the chloroplasts release auxin after enzymatic hydrolysis by tryptic extract, trypsin and chymotrypsin. Papain produced little hydrolysis at *p*H 4 or 6. Diffusion experiments indicate that leaf auxins and the auxins released from the protein of the leaf are similar and of lower molecular weight than indol-acetic acid.

Systematics of Polychæta

OLGA HARTMAN has examined critically fifty type specimens of Polychæta in the United States National Museum ("The Identity of some Marine Annelid Worms in the United States National Museum", *Proc. United States Nat. Mus.*, **92**; 1942). The species have been minutely examined, and emended descriptions are given in most cases. Among these type specimens is *Phyllodoce fragilis* Webster, and it is interesting to learn that the author has collected this species frequently at Beaufort, N.C., where it has a tendency to mass together in the interstices of oyster clumps. One new species is proposed, *Lumbriconereis moorei*, for two fragmentary specimens allied to, but not identical with, *L. minuscula* Moore. These occurred in 1,350–2,182 fathoms off Catalina Island and possess greatly elongated setæ in the anterior segments—a characteristic apparently of certain deep-water forms, or, possibly, of a unique type of substratum. Most of those with this particular feature occur on blue mud. E. and C. Berkeley publish a list of Polychæta collected at the northern extremity of the west coast of North America ("North Pacific Polychæta, chiefly from the West Coast of Vancouver Island, Alaska and Bering Sea" *Canad. J. Res.*, **20**, No. 7; July 1942). There are interesting remarks connected with some of the species. Observations on *Phyllochætopterus prolifica* Potts confirm Potts's own supposition that although he observed no individuals with sexual products (having described in some detail the process of asexual reproduction) this was probably due to insufficient examination. The present work shows that mature individuals of both sexes have frequently been found in tubes. There are four new species in this collection, including two of Pista, *P. pacifica* and *P. moorei*.

Mycological Taxonomy

A STUDY of type species of agaricaceous genera by Rolf Singer (*Lloydia*, **5**, No. 2; June 1942) utilizes modern conceptions of the presence of clamp connexions in hyphæ, and the presence of starch or other substances in spores, as practical diagnostic characters even in old, dried herbarium specimens. Most of the types studied are peculiarly American, but the British mycologist can obtain useful ideas on taxonomy in general, for several keys to small groups of genera are given, upon the above criteria. Fifty-two new species of fungi from Florida are described in the same number of *Lloydia* by Wm. A. Murrill. These are named according to American groups, but are mainly included under Saccardo's genera Psathyra, Panæolus, Galera, Tricholoma, Clitopilus, Volvaria, Hygrophorus and Collybia.

Cultivation of Derris in India

THE main toxic constituent of derris is rotenone, but along with it are several other related toxic substances. These substances have, hitherto, been found to occur in only a few species of plants belonging to the natural order Leguminosæ. T. P. Ghose in a communication entitled "A note on *Derris* and other Rotenone Bearing Vegetable Insecticides, their Occurrence and Possibilities of Cultivation in India", has discussed this subject (*Indian Forest Leaflet*, No. 20 (Chemistry). Forest Research Institute, Dehra Dun, 1942). It appears that search for such rotenone-bearing insecticides has resulted in the discovery of rotenone in the following plants that are indigenous to India: *Derris ferruginea*, *Millettia pachycarpa* and *Tephrosia candida*. The existing material is sufficiently rich for the preparation of efficient fluid or powder insecticides. It is suggested that by selection of suitable strains and by proper cultivation it may be possible to improve the rotenone content of the above mentioned species. Furthermore, several localities in India have suitable climatic and soil conditions to warrant the introduction and cultivation of richer varieties of commercial derris such as *Derris elliptica* or *D. malaccensis* indigenous to Malaya. Experiments have been carried out that yielded encouraging results in Mysore, Cochin and Assam.

Copper-bearing Protein in Cow's Milk

THE presence of copper in tissues is known to be essential for the formation of hæmic iron in animals and to play a part in the form of copper proteins as oxidases in plants. The presence in animal tissues of a non-hæmin iron associated with copper as a copper-iron nucleoprotein is reported. Cow's milk contains 0·09–0·17 mgm. of copper per lit., and W. L. Dills and J. M. Nelson (*J. Amer. Chem. Soc.*, 64, 1616; 1942) isolated from it a protein containing about 15 per cent of nitrogen and 0·19 per cent of copper. Dialysis showed that the copper was non-ionic. Enzymatic activity was not found either in relation to ascorbic acid oxidase activity or polyphenolase activity.

Ester Hydrolysis

THE reactions between tertiary butyl and benzyl nitrates with water and hydroxyl ion differ; in the first case, hydrolyses to alcohol and to olefin occur:

$$C_4H_9ONO_2 + 2H_2O = C_4H_9OH + H_3O^{\cdot} + NO_3' \quad (A)$$
$$C_4H_9ONO_2 + H_2O = C_4H_8 + H_3O^{\cdot} + NO_3', \quad (B)$$

whilst in the second no olefin is produced but the alcohol-forming reaction is accompanied by a first order reaction giving benzaldehyde and nitrous acid:

$$C_6H_5CH_2ONO_2 + 2H_2O = C_6H_5CH_2OH + H_3O^{\cdot} + NO_3' \quad (C)$$
$$C_6H_5CH_2ONO_2 = C_6H_5CHO + HNO_2; \quad (D)$$

and second order reactions with hydroxyl ion:

$$C_6H_5CH_2ONO_2 + OH' = C_6H_5CH_2OH + NO_3' \quad (E)$$
$$C_6H_5CH_2ONO_2 + OH' = C_6H_5CHO + H_2O + NO_2' \quad (F)$$

G. R. Lucas and L. P. Hammett (*J. Amer. Chem. Soc.*, **64**, 1928; 1942) show that the kinetics of the reactions strongly indicate identical mechanisms for the *t*-butyl nitrate and halides, the latter previously investigated by Ingold and collaborators (*J. Chem. Soc.*, 925, 960 f.; 1940). No appreciable reaction with hydroxyl ion or catalysis by acids was observed. It is shown that perchlorate ion accelerates the reaction but hydroxyl ibn retards it, and other ions have intermediate effects which parallel their effects on the activity of water in the medium. This materially weakens a kinetic argument previously used for a free carbonium ion intermediate in hydrolytic reactions. The kinetics of hydrolysis of benzyl nitrate to benzyl alcohol suggests that the reaction partakes more largely of true hydrolysis rather than displacement of anion by a water molecule than does that of the halide. There is pronounced acceleration by hydroxyl ion but acids have no effect. These results suggest that the explanation of the mechanism of ester hydrolysis is less final than has recently been supposed.