thousands of times over in the field. Many new varieties rise by hybridization through sexual crossing of existing varieties, but others occur without inter-breeding, through the "straight evolution" process of mutation or "sporting". There is an endless race between the plant breeder and the natural new origin of these plant diseases. The breeder will carefully produce a new crop variety that is resistant to all known diseases—only to have a newly-originated disease attack it.

Young plants, cut down and buried in the soil as fertilizer, decay much more quickly than older plants of the same kinds do. This was one of the points discussed by Dr. Selman, A. Waksman of the New Jersey Agricultural Experiment Station. In these experiments a number of plants were cut at different stages of growth and definite amounts allowed to undergo decomposition by micro-organisms, under identical conditions. Of the young plants, 73 per cent. of their material was decomposed in thirty days, while it took sixty days to decompose only 42 per cent. of the material of older plants. One of the reasons for the difference in decomposition rate is the marked difference in the chemical make-up of older and younger plants. The older plants contain higher proportions of more resistant materials, especially the celluloses and lignins. The latter substances, which are the basis of the "woodiness" of wood, are exceedingly difficult for bacteria, fungi and other micro-organisms to digest. Moreover, there is a difference between the lignins of old and young plants; in the younger state the lignins are chemically "tenderer" and easier to break down. Differences in humus formation in the soil are traceable not only to differences in the plant materials that are decomposed but also in the living agents of decay, the bacteria, molds, protozoa and other microscopic forms. Insects, worms and other larger animals that feed on dead wood and leaves also aid by chewing them into more manageable morsels for the smaller creatures. The relative abundance of these micro-organisms is influenced partly by the nature of the dead plant materials themselves, for some of them like wood, others straw, still others dead leaves; and also by such factors as temperature, moisture, soil ventilation and soil acidity or alkalinity.

X-raying plants to produce hereditary changes in their offspring is not limited in its effects to what happens in the immediate outcome. An x-rayed plant may produce offspring with new peculiarities, such as changed leaf-size or flower-colour, which will duly appear in subsequent generations. But these generations may also begin to produce other changes, even without being x-rayed themselves. Changes of this character, and an explanation for them, were described by Professor T. H. Goodspeed, of the University of California, one of the pioneers in the field of x-ray genetics. While the details of the process are highly technical, the essential fact underlying the three types of cellular change is a state of instability, of continuing change, induced in the chromosomes by the first impact of the x-ray bombardment. (*Extract from Science—Supplement*—Vol. 82, No. 2123, pp. 10-13).

ABSTRACTS

Effects of Ethylene on Plant Growth Hormone. *Science.* Vol 82, No. 2156, p. 151. Heteroauxin, or plant growth hormone (B-indolyl-acetic acid) is known to have several effects on plants, including promotion of stem elongation, inhibition of bud growth, stimulation of root formation, production of stem swellings and stimulation of epinastic movements of the leaves. With the exception of the first two, ethylene gas also has these effects.

According to A. E. Hitchcock, ethylene, heteroauxin and other substances all act in essentially the same way. This conclusion is based, apparently, on the similarity of the effects of ethylene to those of heteroauxin. There are many cases, however, where these two substances do not have the same effect.

For instance, heteroauxin increases the growth rate of *Avena coleoptiles*, and the amount of increase is dependent on the amount of heteroauxin supplied. If ethylene has the same effect, it should increase the growth rate, and the degree of increase should depend on the concentration of the ethylene. However, four groups of Avena seedlings were placed for twentyfour hours in, respectively, air 0·001 per cent, ethylene, 0·2 per cent, ethylene and 2 per cent. ethylene. The rate of growth in all three of the groups treated with ethylene was approximately the same, and was about 30 per cent. less than the rate of growth of the controls. It thus appears that, in this case, ethylene could not have acted in the same manner as a growth hormone.

It is well known also that heteroauxin increases the number of roots formed by pea cuttings. These cuttings can take up enough hormone to give maximum root formation when placed inversely in a solution of hormone for twelve hours. However, when they were placed for twenty-four hours in an atmosphere containing ethylene (whether treated with hormone or not), root formation was not affected.

Cuttings of *Salix* were also used for tests on the effect of ethylene. The experiments described here were performed in May. The cuttings were of second-year wood and about eighteen centimeters long. Four groups of cuttings were treated in different ways, as follows: (1) control, (2) 0·1 per cent. ethylene for two weeks, (3) heteroauxin applied to the top of the cuttings in the form of lanoline paste, treated both with heteroauxin and 0·1 per cent. ethylene. The roots were counted two weeks after the experiment was begun.

Method of treatment.	Average number of roots per cutting.	Increase over controls caused by treatment.
Controls	11·9 ± 0·6	
Ehtylene	16·2 ± 1·2	4·3
Heteroauxin	23·1 ± 1·5	11·2
Ethylene and heteroauxin	40·5 ± 2·3	28 6

Following are some data obtained from these experiments. The average number of roots per cutting is given, with the probable error.

It seems impossible to explain these results on the theory that ethylene acts in the same manner as a growth hormone. It will be seen that the ethylene alone increases the number of roots by 4·3, and the heteroauxin alone increases it by 11·2. If the ethylene acts in the manner of a growth hormone, the ethylene and heteroauxin together could not increase the number of roots by more than 15.5, or the sum of the two preceding figures. Nevertheless, in this experiment the increase was not 15·5 or less, but 28·6. It appears, therefore, that ethylene cannot be acting directly to stimulate root formation, but that it must in some way cause the growth hormone to become more active.

In none of the above experiments can the ethylene have acted in the same manner as a growth hormone. It seems probable, therefore, that all the effects of ethylene on growth are to be explained, not as direct effects of ethylene alone, but as effects of ethylene on a growth hormone.

Pigments of Cotton flowers. Part II. Uppam. *Gossypium herbaceum*. By K. Neelakantan, T. R. Seshadri and R. H. Ramachandra Rao. (*Proc. Indian Academy of Science*, Vol. II. No. 5, Section A, pp. 490 to 498). Petals of flowers of the *Uppam* variety of cotton, collected from the Central Farm, Coimbatore, were used by the authors, for an investigation into the nature of the pigments present. Formerly Perkin had done similar study on petals which he seems to have obtained from North India, and it is interesting to note that the present work is an advance on Perkin's findings. Perkin reported the presence of Gossypitrin as the main component, with small quantities of iso-quercitin. The present authors however find, that while the presence of gossypitrin as the main component is confirmed, a good amount of quercitin and small quantities of a new glycoside and of gossypetin, are also present in the pigments; the authors have employed for the alkali colour reactions, buffer solutions of varying pH values from 6·8 to 11·0 and these have served to bring out clearly the differences between the two substances gossypitrin and gossypetin, and therefore helped to establish the presence of both these different compounds in the pigments.

A detailed further report on the new glycoside—which is different from gossypitrin and quercimeritrin is promised and will be looked forward to with interest.

M. R. B.

An analysis of the influence of season on photosynthesis in the tropics. By B. N. Singh and K. Kumar. (*Proc. Ind. Acad. Sci.*, Vol. II, No. 5—Section B. pp. 437 to 457). The paper sets down the record of an extremely systematic investigation into the effect of season on the photosynthesis of radish leaves collected from plants, which to supply material right through the year, were planted at successive intervals of fifteen days. Some of the interesting information obtained from the experiments, may be classified under the following heads, which, in fact, represent the lines of attack of the problem.

(1) Variations in the intensity of assimilation in *different seasons*, under *one set* of external factors—(a temperature of 29°C, light 28650 M. C. and Co_2 0·049 gm. per 100 c. c). There is a decline in the photosynthetic rate, from cool January to the spring in March and from March to the midsummer in June, with the coming in of winter in October there is a rise in assimilation. (2) Seasonal assimilation under *varying sets* of environmental factors. It was again seen that there was a decline in intensity of assimilation during the summer months, bnt increased temperature between 29—37°C is efficient in increasing assimilatory activity during this period. An increase however of illumination and carbon dioxide concentration, is more effective in increasing assimilation, during winter than during summer months. (3) *Morphological and structural changes.* The radish plants undergo changes with the season, the height de reases, the weight of radishes diminishes (from 8 lb. to ¼ lb.) and total leaf becomes less, as we pass from winter to summer. (4) *The chlorophyll content* runs paralelled to the assimilatory capacity and is highest during winter and lowest in summer.

In general, photosynthesis and plant vigour are more in evidence in winter, than during summer in spite of the increase of light and temperature during the latter period. It is also interesting to find that respiratory activity is very low during the summer months and the authors suggest that the leaves adapt their structure and function according to the intensity of the external factors present.

M. R. B.

Gleanings.

Giant Tobacco. Tobacco plants as tall as trees are among the strange vegetation of the lower Andian country now being investigated by an expedition from the University of California, under Professor T. H. Goodspeed. One of the tremendous growths measured by Professor Goodspeed was sixty feet high. The expedition is engaged primarily in a search for wild relatives of the common cultivated tobaccos, to be used in hybridisation experiments. Seeds of many other plants, however are being collected. (*Sc. Supp.* Vol. 82, 21, 38, p. 7.)

On the incidence of tuberculosis in the offspring of tuberculous parents. In a total of 564 matings and 2480 offspring the proportionate incidence of tuberculosis among the offspring was found to be in the following ratios by mating types,