ture. Cells grown in 4 per cent. CO_2 show a behavior quite comparable to that of wheat. In the induction shown by cells acclimated to .03 per cent. CO_2 the photoxidation type of reaction predominates to such an extent that minima are produced in both the fluorescence and CO_2-uptake curves (Fig. 4). The

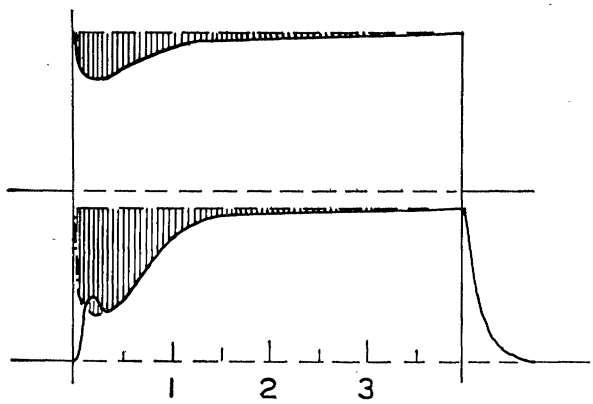

FIG. 4. Induction behavior of *Chlorella* cultured in air. The upper boundaries (broken lines) of the hatched areas are arbitrarily drawn.

arbitrarily drawn broken lines enclose hatched areas representing (as in Fig. 3) what may be considered the minimum extent of the second type of reaction.

The behavior observed in several hundred induction curves, obtained over a wide range of conditions, may be described in terms of two processes. One of these involves an inverse relation between rate of CO_2-uptake and intensity of fluorescence, the other a direct relation. Further and more quantitative work is being undertaken in order to learn more of the nature of these two processes.

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ETHYLENE INJURY TO CUT FLOWERS IN COLD STORAGE ROOMS

IT has been known for some time that even traces of illuminating gas leaking into a greenhouse are detrimental to flowers and plants.[1,2] Little consideration has been given, however, to the possible presence of gases toxic to cut flowers where they are kept in refrigerators to prolong their period of salability.

Investigations have recently been started at the United States Horticultural Station, Beltsville, Maryland, into the problem of increasing the keeping quality of cut flowers. The flowers so far included in these investigations are carnations, roses, snapdragons, stocks and narcissus. They were all, with the exception of the narcissus, grown in the Department greenhouses at Beltsville. The latter were grown in outdoor beds. Ample supplies were available in all instances.

Among the factors studied, that of temperature was given considerable attention in an attempt to find optimum conditions when refrigeration alone was considered.

Early in the course of these experiments it was found that ethylene, which is known to be given off by apples and other ripening fruit,[3,4,5] caused identical injury to cut flowers when they were placed either in sealed containers with ethylene or in storage room with apples or even in rooms close by.

Check lots of flowers at 70°, 50° and 36° F. remained in good condition longer than corresponding lots stored in the presence of fruit or ethylene at the same temperature, and with fruit or ethylene, the higher the temperature, the more pronounced was the effect of the gas.

Carnations, roses, snapdragons, narcissus and stocks under these conditions were all adversely affected. The damage to carnations in full bloom was indicated by an incurving of the edges of the petals and they also became discolored and lost their turgor. This effect was typical of the deterioration of carnations commonly known to flower growers as "sleepiness," which may occur both before and after the flowers are cut, and is believed to result from unfavorable environmental conditions. The symptoms of injury observed on cut roses and snapdragons consisted of a discoloration and early dropping of the petals and flowers. Narcissus and stocks reacted by a deterioration of color and shriveling of the flowers.

In general, florists are of the opinion that carnations keep best at a temperature close to 50° F. However, Neff[6] and the writers have found temperatures between 33° and 36° to be best. The accepted opinion in favor of 50°, rather than the lower temperatures, may have been arrived at as a result of frequent damage to carnations stored in room with ripening apples. Most large cold storage buildings have large quantities of ripening fruit in storage rooms where cut carnations would be stored by florists anticipating peak demands just prior to holidays. Neff reported that his best results were obtained in sealed containers, while the writers used rooms free from the influence of ethylene. Hence in both of these cases the flowers were not damaged by this gas. Most fruits are not generally stored at 50° F. and therefore carnations

[4] National research fellow.

[1] W. Crocker, *Flor. Exc.*, 70: 15 and 54, March 30, 1929.

[2] P. W. Zimmerman, W. Crocker and A. E. Hitchcock, *Proc. Amer. Soc. Hort. Sci.*, 27: 53–56, 1931.

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[4] E. Hansen and H. Hartman, *Plant Physiol.*, 12: 441–454, 1936.

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[6] M. S. Neff, *Plant Physiol.*, 14: 271–284, 1939.

stored at this temperature would not be so apt to be injured by gases from apples or other fruits. It appears that a temperature of 34° to 36° is best for carnations if they are kept in a room free from ethylene.

In the light of these findings it seems desirable that results of flower storage investigations which might have been influenced by the gases from ripening fruit should be repeated. It is also suggested that the effect of ethylene, whatever its source, on plants and plant parts other than cut flowers should be fully investigated as a factor in storage problems.

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THE RELATION OF INTERNAL SURFACE TO INTERCELLULAR SPACE IN FOLIAGE LEAVES

THE relation of the exposed cellular area of the mesophyll of the foliage leaf to the volume of intercellular space has been of considerable interest because the relation has an important bearing on transpiration rate and on other types of gas exchange. Although the volume of intercellular space was measured by Unger as early as 1854 and has been measured by several investigators since, the relation of internal surface to volume of intercellular space has been largely a matter of conjecture.

In a sample of twenty leaves from four alfalfa plants, the coefficient of correlation (r) between the internal-external surface ratio and the volume of intercellular space per sample area, as shown in Table 1,

TABLE 1

THE COEFFICIENT OF CORRELATION (r) AND ITS LEVEL OF SIGNIFICANCE (P) BETWEEN INTERNAL-EXTERNAL SURFACE RATIO AND VOLUME OF INTERCELLULAR SPACE AND BETWEEN INTERNAL-EXTERNAL SURFACE RATIO AND PERCENTAGE VOLUME OF INTERCELLULAR SPACE OF FOLIAGE LEAVES

Leaf samples	Intercellular space	r	P
Alfalfa	Volume	+0.874	< 0.01
Alfalfa	Percentage volume	+0.629	< 0.01
16 species	Volume	+0.463	< 0.10
16 species	Percentage volume	+0.071	> 0.10

was +0.874; and between the internal-external surface ratio and the percentage volume of intercellular space, the coefficient of correlation was +0.629. Although the correlation coefficient is higher between the internal-external surface ratio and volume of intercellular space than between the internal-external surface ratio and percentage volume of intercellular space, for both values the probability of chance occurrence (P) is less than 0.01, and the correlation coefficients are highly significant. The relation of the internal-external surface ratio to other mesophyll factors is expressed by the equation

$$R = \frac{t\,v\,(1-v)\,K}{d}$$

where R = the internal-external surface ratio, t = leaf thickness, v = percentage volume of intercelluar space, d = cell diameter, and K = a constant.

Random samples of leaves of sixteen different angiosperm species from various parts of the world showed no significant correlation (+0.071) between the internal-external surface ratio and the percentage volume of intercellular space, but showed a moderate positive correlation (+0.463) between the internal-external surface ratio and the volume of intercellular space (Table 1). For the latter value, P lies between 0.10 and 0.05 (Table 1); thus the correlation coefficient is not significant.

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THE ENZYMATIC DEACETYLATION OF HEROIN AND CLOSELY RELATED MORPHINE DERIVATIVES BY BLOOD SERUM

IN preliminary experiments designed to study the effect of morphine on choline esterase activity it was found that morphine salts were precipitated as the alkaloidal base in bicarbonate Ringer solution. An attempt was made to obviate this difficulty by using the more soluble and physiologically more active diacetylmorphine (heroin).[1] An apparent stimulation of the activity of choline esterase led to the measurement of the effect of serum on heroin. It was found that rabbit and human blood sera deacetylate diacetylmorphine.

The measurements of the rates of deacetylation were made with Barcroft manometers at 37.5° C. under an atmosphere of 95 per cent. oxygen and 5 per cent. carbon dioxide. The serum was tipped from a side arm of the manometric flask into a bicarbonate-containing solution of the acetylated morphine, and the carbon dioxide liberated was measured manometrically at desired intervals.

Observations were made using sera from six male albino rabbits, all fed Purina rabbit chow and lettuce. Sera (0.05–0.5 cc) from three of the animals, when added to diacetylmorphine (5.0 mgm), caused a rapid liberation of carbon dioxide corresponding in quantity to 85 per cent. of the theoretical for the hydrolysis of both acetyl groups. The other three animals hydrolyzed the heroin more slowly, and liberated carbon dioxide corresponding to 85 per cent. of the theoretical

[1] I am indebted to Dr. L. F. Small, of the National Institute of Health, for furnishing the morphine derivatives and for consultation on their chemistry.