Determination of World Plant Formations From Simple Climatic Data

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While attempting to understand relationships between the mountain vegetation of an area in Haiti and other vegetation units of the island and surrounding regions, the literature was searched unsuccessfully for a comprehensive system which presented formations or vegetation units on a relatively equal or comparable basis. To fulfill such a need, a chart (Fig. 1) was constructed which differentiates the vegetation of dry land areas of the world into 100 closely equivalent formations separated by temperature, precipitation, and evaporation lines of equal value.

Mean temperature values used approximate those of the growing season and are determined for specific sites by adding the average mean monthly temperatures greater than 0°C. and dividing by 12. Such values for lower elevations establish several regions north and south of the heat equator, as indicated on the left, and at higher elevations the belts listed at the right. Because of the difference in vegetation caused by the presence or absence of frost in the warm temperate region and the lower montane belt, a frost line is recognized which separates the low subtropical region and the subtropical belt formations as vegetation units usually present between the 24° isotherm and the limits of killing frosts.

The precipitation value used for a locality is the average mean annual precipitation in millimeters. The temperature and precipitation values for any site plotted logarithmically on the chart determine a point which falls within a hexagon representing a formation. When the point falls within one of the border triangles of a hexagon, the vegetation of that area will show a transitional character.

For altitudinal adjustment, approximate elevation in meters above sea level must be known to be certain of the region to which the formation belongs. All altitudinal belts will be found only in the tropics. In other regions, only the belts above the basal formations of the region on the chart will be encountered. Elevations of formation boundaries vary considerably, but the ranges of the belts approximate the following: nival—indefinite, alpine—500 m., subalpine—500 m., montane—1,000 m., and lower montane alone or with the subtropical if present—2,000 m. The tropical basal region varies from 0 to 1,000 m.; the warm temperate alone or with the low subtropical, 0–2,000 m.; and the basal formations of the other regions, from 0 m. to the maximum for the corresponding belt.

Thus, a station below 500 m. in elevation with means of

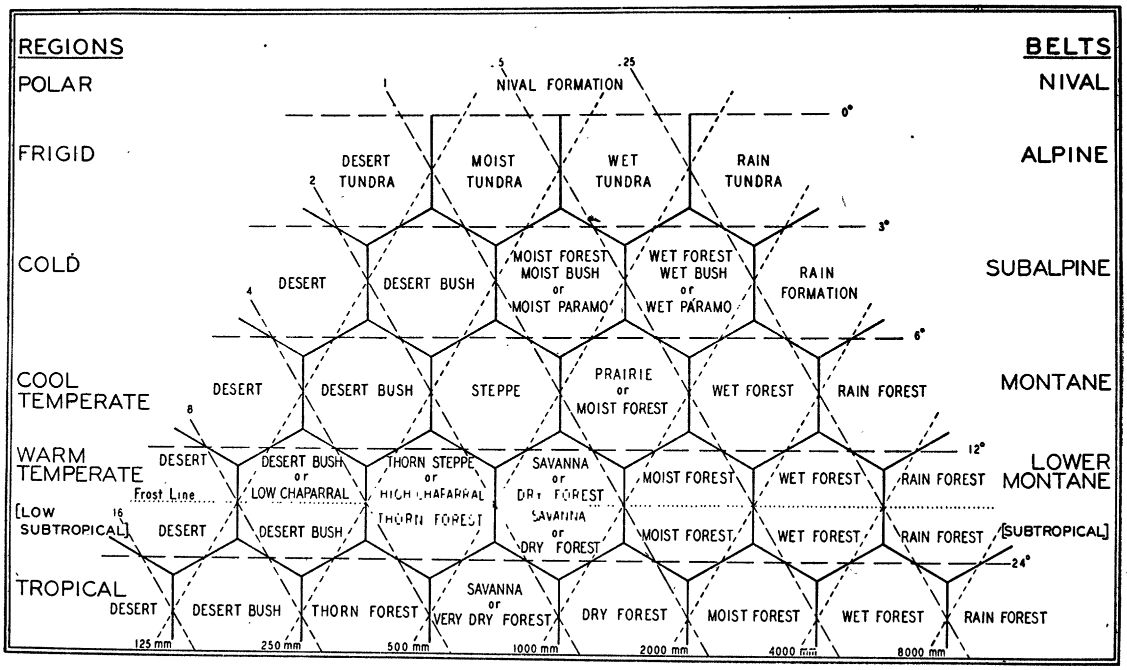

FIG. 1

8°C. and 360 mm. would fall in the cool temperate steppe formation. If the same values were obtained for a station 2,500 m. above sea level, the formation would be warm temperate montane steppe. Formations with common precipitation and temperature boundaries, but occurring at different elevations in adjacent regions, are termed linked formations because they show closer affinities than other adjacent formations separated by temperature or precipitation boundaries.

The evaporation lines are not essential to the use of the chart. These are inserted to show the other balancing factor in the chart, and the values indicated are thought to represent the number of times the actual precipitation could be evaporated in one year at sea-level atmospheric pressure. No data are available to support these suggestions regarding evaporation.

The chart is designed to make broad divisions and to show actual relations between climatic vegetation formations. Local edaphic conditions, such as salinity or a high water table as well as alteration by man, can obviously change the appearance of the vegetation to a great extent. Two or more names were found necessary at times, partly because formations from both low and high elevations are represented on a two-dimensional chart and partly because certain easily determined factors, such as topography in grass or tree formations and the difference between continental- and mediterranean-type climates, make possible vegetations of a distinct appearance under similar climatic conditions. Further details and examples will be given in a paper now in preparation.

Detection of Hypoglycemic Reactions in the Mouse Assay for Insulin

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In 1946 Thompson (*4*) described a sloping-screen technique for use in the mouse assay of insulin. This technique avoids the subjective selection of convulsive animals necessary in the more conventional methods (*2, 5*) and reduces personnel requirements.

One disadvantage of Thompson's method, as observed in these Laboratories, lies in the fact that the mice do not fall away from the screen until signs of insulin shock are far advanced, and, even though the mice are immediately injected with glucose, the mortality is high.

Fig. 1 shows a unit which was developed in these Laboratories in an attempt to overcome the difficulty noted.[1] The unit consists of 6 hollow cylinders, 8 inches in diameter and 27 inches long, mounted at an angle of 60° on wooden rollers. Five inches of each end of each cylinder is constructed of 22-gauge galvanized iron, and the central section, 17 inches in length, is constructed from $\frac{1}{4}$-inch wire mesh. The wooden rollers, motor driven at a constant speed, make contact with the cylinders through plywood bands which encircle the cylinders $2\frac{1}{2}$ inches from top and base. Each cylinder rotates once every 40 seconds. The cylinders may be removed from the rollers for cleaning and emptying. The unit is housed in a room with a temperature range of 23–25° C.

[1] The authors wish to express appreciation to W. Parkinson and D. P. Joel for technical assistance in construction of the apparatus.

In performing an insulin assay, mice are injected subcutaneously with suitable amounts of the insulin preparations to be compared and are loaded into the rotating cylinders, each of which will readily accommodate 40 animals. The rotation assures that the foothold of the mice is never secure for long. At the first sign of insulin shock they fall away into trays placed beneath the individual cylinders. These contain rabbit chow pellets, and in almost all cases the mice falling into the trays are able to eat sufficient food to relieve their hypoglycemic signs, so that injection with glucose is unnecessary. When a specified interval has elapsed after injection, the mice which have fallen away from the cylinders are counted, the numbers so obtained being used in computing the required estimates of potency and precision.

Fig. 1

Results obtained from 35 consecutive assays were utilized in estimating the slope of the logarithm-dosage response relationship. A two-dose technique similar to that outlined by Miller, Bliss, and Braun (*3*) was employed in each assay. The ratio of the higher dose of standard to the lower dose of standard was 2:1 in all cases. The higher dose in the different assays varied from 0.025 to 0.010 I. U. of insulin/mouse. Thirty-six mice were used at each level. In each assay the numbers of reactions which had occurred at 45 and 60 minutes after injection of insulin were noted.

The percentages of animals responding to the two doses of standard were transformed to probits, and the slopes of the logarithm-dosage response curves were computed. The average slopes at 45 and 60 minutes were found to be 3.2 and 3.3, respectively. There was no indication from the χ^2 tests that the slopes varied significantly from one assay to another. The values obtained are of the same order of magnitude as the value 3.5 obtained by Marks and Pak (*2*) and the value 3.0 obtained by Trevan as calculated by Irwin (*1*).

The mortality among the first 18,000 mice placed on test was found to be 1.7 per cent, an appreciable decrease from mortalities of 7–10 per cent experienced in these Laboratories with more conventional procedures. It was found that two operators, using the unit described, could perform all the work necessary for a 1,000-mouse assay in one working day, whereas with the procedure previously used four operators were employed to perform assays of this size. Efficiency was increased somewhat by assaying two unknown samples of insulin (two cylinders per unknown) against one standard (two cylinders) on each run.

It is reasonable to suppose that the apparatus might also