Piedmont Plains of India and Pakistan

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There is hardly any literature on the piedmont plains of India, although their origin and other characteristic features are interesting. The base of the Himalayas is generally fringed by alluvial fans so closely spaced that they form one continuous plain. They are largely composed of gravels and sand, with interspersed boulders brought down by floods produced by torrential rains. The composition of the soils, their porosity, and their inability to retain water are some of the factors that render them unfit for cultivation. On the other hand, they are covered locally with forests or dense jungle. In India there are excellent examples of such plains, which are called *bhabar*. These fans merge with the alluvial plains composed of finer materials, called *tarai*.

Bhabar plains. Bhabar forms a narrow belt lying immediately below the foothills of the Himalayas. It is a sloping deposit of gravels with occasional sand and clay beds. It is especially developed in the Naini Tal district, is generally covered with forest, and is remarkable for a complete absence of water. On reaching this *bhabar* zone most streams disappear. Large streams preserve their courses with marked diminution in volume, and their breadth increases abruptly, but the smaller watercourses, which have their origin in the lower hills, lose themselves in the shingle deposit. The slope of the surface is generally toward the south, and the breadth of the zone varies from 5 to 15 miles. The forest vegetation derives its nourishment from a thin covering of alluvial soil that overlies the coarse alluvium. Instead of tall grasses, large trees of haldu (*Adina cordifolia*) and *Acacia catechu* are to be observed. The cultivation depends upon canal irrigation, which is provided from the streams of lower hills. The slope of the ground between the foothills and the *tarai* is appreciable, though not easily observed. The population is largely migratory and moves to the hills in summer and returns in November.

Tarai plains. Below the *bhabar* occur the *tarai* plains, which form a belt about 11 miles wide from north to south in Nepal, Bihar, in the districts of Naini Tal, etc. The plain slopes gently toward the southeast and is covered with forests and swamps, broken by scattered patches of cultivation. The northern half consists either of jungle or savanna, where the country is suited only for grazing.

At the southern edge of the *bhabar,* springs appear in a series of morasses, their number and size depending upon the breadth of the *bhabar*. Where the *bhabar* is narrow, the springs are feeble. From them rise sluggish streams with poorly defined channels.

The moist plains of *tarai* pass gradually into the plains of the Ganges at lower elevations. The change is transitional, as the soil loses its marshy nature, different vegetation appears, and the climate becomes more healthful. Rice is the main crop of this region. The partition of the country and the refugee problem have thrown extra pressure on the land, and the *tarai* lands, especially in the Naini Tal region, are being reclaimed for the rehabilitation of some refugee families.

Piedmont plain of Baluchistan. Baluchistan provides an interesting example of the piedmont plains in an arid climate. Here the mountains are fringed by alluvial fans and talus of Pleistocene age. The slope of these coalescing fans, locally called *daman,* is so gentle that it looks like a very gently inclined plain. These compound fans have a variable composition, consisting of alternating coarse conglomerates and finer deposits. The scanty rainfall is absorbed and stored in the permeable conglomerates, which perform an important role in the economic geography of the region. Horizontal tunnels, called *karez,* which may be several miles in length, are bored into the sloping deposits until they reach the water table. The water is held under hydrostatic pressure, which makes it flow at the mouth of the tunnel. Recently artesian wells have been sunk in these deposits, creating oases in an otherwise barren desert.

Free Amino Acids in Potato Tubers Altered by 2,4-D Treatment of Plants

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A number of workers have studied the effects of natural and synthetic plant hormones on nitrogen metabolism (*1–13*). A survey of the literature has failed to show a critical study of the free amino acids in plants treated with natural or synthetic plant hormones. The free amino acids, especially glutamic acid, have been shown to occupy a key position in the interpretations of the mechanisms of respiration and protein synthesis. Investigations of the free amino acids in hormone-treated potatoes were begun at this station in the summer of 1950.

The Red McClure potatoes used were selected from the "field test samples" described by Payne *et al.* (*14*). Treated and untreated tubers were frozen and then allowed to thaw. The free soluble amino acids were extracted according to Morrow and Sandstrom (*15*). The filtrates were concentrated to one fifth their original volume. The technique of paper partition chromatography, devised originally by Consden, Gordon, and Martin (*16*), and later used on potato extracts by Dent, Stepka, and Steward (*17*), was employed. For the one-dimensional chromatograms 1 μl of the concentrated filtrate was used on Whatman No. 1 filter paper in a phenol-H_2O system.

Relative densities of the amino acid spots were

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determined by use of a Welch densichron No. 2150 with a green N filter.

The data are shown in Table 1. Each value is the

TABLE 1

EFFECT OF 2,4-D TREATMENT ON FREE AMINO ACIDS IN TUBERS OF RED MCCLURE POTATOES*†

Spot No.	Amino acids	Mean densichron units: Treated	Mean densichron units: Control	Diff	Standard deviation	Standard error	Min diff req for significance: .05	Min diff req for significance: .01
1	Isoleucine phenylalanine	1.63	1.95	0.32	0.13	0.04	0.03	0.04
2	Valine, γ amino butyric acid	2.06	2.35	.29	.18	.05	.14	.19
3	Lysine	1.46	1.58	.12	.14	.04	.11	.15
4	Glutamine, alanine	2.47	2.82	.35	.14	.04	.11	.15
5	Threonine	1.40	1.58	.18	.10	.03	.08	.11
6	Asparagine	1.78	1.93	.15	.10	.03	.08	.11
7	Serine	1.46	1.56	.10	.03	.03	.08	.11
8	Glutamic acid	2.68	2.47	.21	.15	.04	.12	.16
9	Aspartic acid	2.07	2.17	0.10	0.12	0.03	0.09	0.12

* Arginine, proline, histidine, tyrosine, methionine sulfoxide, and cysteic acid, although identified by two-dimensional chromatograms, appeared in concentrations too small to measure.

† Concentrated filtrates were used on one-dimensional chromatograms for this table.

mean of 14 determinations except in the case of serine, where only 10 determinations were used. Only 12 of the possible 18 amino acids identified in the concentrated filtrate were critically measured. The data show that all the free amino acids measured were significantly decreased in the treated samples, with the exception of glutamic acid. Glutamic acid in the treated samples showed a significant increase over the controls.

Complete details of this work and its significance in the interpretation of the mechanism of 2,4-D action are being published elsewhere.

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The Growth of Peanut Plants at Various Diurnal and Nocturnal Temperatures

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While doing research on other problems of peanut development at the California Institute of Technology, the opportunity was taken of studying the effects of controlled temperatures on the growth of the improved Valencia variety of *Arachis hypogaea* L. Although large-scale experiments were not carried out under the two colder night temperatures, the observed differences were so marked and clear-cut that it seems worth while to report them.

The air-conditioned greenhouses at the California Institute of Technology have been described by Went (*1*). Peanut seeds were germinated outdoors in early September, and 16 plants were moved into the greenhouse on October 2, 1945, when the mean height of each replicate was 1.4 in. measured from the cotyledonary node to the distal attached edge of the stipules on the topmost extended leaf. Groups of four plants were placed under each of the temperature combinations indicated in the first column of Table 1. All plants had 8 hr of daylight and were grown in coarse sand watered twice daily with Hoagland's nutrient solution. The growth after 2 weeks is shown in Table 1. At this time all leaves of 26°-day plants were a healthy dark-green and were about 2 in. long. The younger leaves of the 18°-day plants were all yellow, none exceeding 1.3 in. in length.

Although the first flower appeared by October 17 on a 26°-day: 30°-night plant, by November 7 the 26°-day: 27°-night plants had an average of 4 gynophores/plant contrasted to only 1 gynophore/plant for the 26°-day: 30°-night plants. The latter showed markedly greater vegetative growth, however. No flowers appeared on the 18°-day: 16°-night plants during the 4 months of the experiment. Although a few flowers with unelongated calyx tubes appeared on the 18°-day: 22°-night plants after November 16, no gynophores developed from the 18°-day plants during the ensuing 4 months. (The developmental anatomy and physiology of the gynophore are described by Jacobs [*2*, *3*].)

The results with peanut plants agree with those of

TABLE 1

VEGETATIVE GROWTH OF PEANUT PLANTS UNDER VARIOUS TEMPERATURE COMBINATIONS

Temperature: Day	Temperature: Night	Mean height (inches)	Mean number of branches
26°	30°	2.8	9.3
26	27	2.6	8.0
18	22	1.7	5.5
18°	16°	1.7	5.0