Position Classification Flysheet for Plant Physiology Series, GS-0435

Table of Contents

SERIES DEFINITION **2**

SERIES RELATIONSHIP **2**

BACKGROUND INFORMATION **4**

TITLES **5**

DETERMINING GRADE LEVELS OF POSITIONS **5**

SERIES DEFINITION

This series includes positions which involve research or other professional and scientific work pertaining to one or more of such vital functions as plant growth, nutrition, respiration, and reproduction that are essential to the life of the plant or its use. This includes work on the internal processes such as assimilation, photosynthesis, translocation, or transpiration that are involved in vital functions; or on the influence which one or more environmental factors, such as humidity, water, light, mineral nutrients, and temperature have on these functions and processes.

This standard supersedes the standard for the Plant Physiology Series, GS-0436, initially published under the code P-86 in April 1948.

SERIES RELATIONSHIP

Excluded from this series are the following classes of positions:

1. Positions concerned primarily with the investigation of the chemistry of compounds and the relationship between the chemical and physical properties of such compounds, but where the work is not performed as part of or in conjunction with the further investigation of the relationship between the compounds and their properties and the life functions and processes of the plant, are classifiable in the Chemistry Series, GS-1320.

2. Positions concerned with the investigation of the nature, prevalence, and severity of plant diseases caused principally by fungi, bacteria, and viruses, and the control of such diseases are included in the Plant Pathology Series, GS-0434.

3. Positions concerned with anatomical, cytological, and histological studies in the investigation of the internal and external structure of a plant and the establishment of data pertaining thereto, where the work is not primarily concerned with the relationship if the plant structure to the general economy of the plant life, are classifiable in the Botany Series, GS-0430.

4. Positions concerned with the application of basic physiological principles and the regulation of environmental influences relating to the improvement of plant growth, propagation, quality, or yield, rather than the investigation or determination of such principles and influences or the formal establishment of data pertaining thereto, are classifiable in the Agronomy Series, GS-0471, the Forestry Series, GS-0460, or the Horticulture Series, GS-0437, depending upon the crop involved.

5. Positions concerned with the investigation of the biological, chemical, and physical properties and processes of the soil for the purpose of conserving soils and improving plant productivity are classifiable in the Soil Science Series, GS-0470.

6. Positions concerned with the investigation of or experimentation in the processing of plant products used as food stuffs, e.g., dehydration studies, determination of the stage of

development best suited for a particular use of a plant product, the making of vitamin determination relative to the product, and the investigation of the influence of storage, transportation, packaging, and handling on nonliving plant materials or products all come within the fields of nutrition research or food technology. Depending upon the particular study, its objective, or the methods and techniques employed, such positions are classifiable in the Chemistry Series, GS-1320, or the Food Technology Series, GS-1382, or another appropriate series.

One cannot parcel off the sciences like a building plot with any reasonable degree of accuracy, validity, or logic. As knowledge increases, the boundaries initially established disappear and immediately there becomes apparent additional evidence of the fact that science is one great totality whose parts are in reciprocal relation. For practical purposes, however, particularly in the field of personnel administration, some lines of "distinction" among the sciences must be drawn. Frequently, however, these lines are, of necessity, arbitrary ones and should be continually recognized as such.

The field of plant physiology is a case in point. While it is a botanical subject and closely related to agronomy, anatomy, forestry, and horticulture, at the same time it depends so heavily upon chemistry and physics that in certain of its phases, at least, it appears integral with them.

Supplemental to the series exclusions already defined, the following discussion should indicate for personnel administration purposes the point of differentiation between plant physiology and each of its related sciences.

1. The plant physiologist, like the anatomist, morphologist, or taxonomist, must possess a descriptive knowledge of the structure of the plant organism; unlike them, however, he does not stop with the acquisition and classification of this knowledge but uses it in the continuation of his investigation as a means of understanding the function of the individual organic structure in the general life economy of the individual plant.

2. The plant physiologist seems to, and often does, pursue the same studies as the plant chemist, but when he does, his objective is not the same. He is interested in the behavior causes of the living organism whereas, usually, the chemist may be interested only in the condition of the lifeless. While the plant physiologist may kill the organism or work with material that is lifeless from the start, he does so with the ultimate purpose of learning more about life and the living organism.

   A scientist who is interested in the plant constituents as chemical substances in relation to life processes may be either a biochemist or plant physiologist. It is in the field of biochemistry that the plant physiologist and the chemist are, in certain respects, identical. Both investigate chemical compounds and chemical processes which occur in plants. Both study the influence of chemicals on the vital processes of plant life. In such investigations, both use the same methods and techniques. These two positions become distinct when the work of the plant physiologist requires, in addition to his biochemical investigations, a knowledge and use of anatomy and one or more of the applied agricultural sciences.

3. Distinctions between the plant physiologist and the agronomist, plant ecologist, or horticulturist are likewise often obscure and based upon a difference in objective in those instances in which their respective performances are identical. Insofar as their similarity is concerned, the plant physiologist may wish to study field conditions, and even to experiment with agricultural practices, as a means of determining their influence on normal functions within the plant. Likewise, the agronomist may wish to study normal functions and processes in order to simulate or maintain field conditions favorable to them.

BACKGROUND INFORMATION

Plant physiology in its broadest sense is the study of the interrelations, structure, development, life, life processes, and environment of plants. In its narrowest sense, it is the mechanism of life functions in plants. While the latter definition is probably the more accurate one, the former is the more practical in terms of what Federal plant physiologists actually do, since, as has already been pointed out, the function cannot be separated from the material in which it occurs and the environment to which the system is exposed. Plant physiology rests upon a tri-pod of anatomy, chemistry, and physics. The means which the plant physiologist must employ in the achievement of his objective are physical, chemical, and anatomical; and he must understand the significance of their interrelationships.

The principles applied and actual methods of inquiry employed by plant physiologists are similar to those of the anatomist, the chemist, or the physicist, i.e., they are similar to those used in the study of nonliving matter. The use of such methods is necessary because the plant physiologist endeavors to explain in terms of physics and chemistry the phenomena manifested by the living plant. Since these sciences are quantitative rather than descriptive, the plant physiologist must reduce his data to a quantitative basis whenever possible.

The plant physiologist is concerned in anatomical studies with form and structure insofar as they influence life functions or processes or pertain to plant quality. His work includes the investigation of the internal anatomy (i.e., microanalysis and the physiology of the cell), and the study of the external anatomy insofar as external features have any significance in relation to functions or processes. Specific studies may relate to seed problems, germination, reproduction, vegetative propagation, structure in relation to use, or the configuration of plants.

The plant physiologist doing chemical studies investigates the influence of chemical compounds and processes upon or occurring in plants as regards the vital function of the plant, e.g., the effects of food, drugs, and chemicals on plant tissue, structure, growth, nutritional state, and pathological condition. He may be concerned mainly with any of the processes included under the broad subject of metabolism in relation to environment. In the investigation of life processes and functions, he applies techniques and measuring devices developed in the field of physics. In a study he may be interested in the physical processes and phenomena of a plant organism in contradistinction to its chemical properties and processes. In this connection, he studies physical and structural effects of such environmental factors as radiant energy, temperature, humidity, pressures upon the plant, its organs, or tissues; or the role of electrical phenomena, surface

tensions, gas exchange, permeability, movement of specific ions, or other particles into or within the plant.

Plant physiologists study and investigate the vital functions of growth, nutrition, reproduction, and respiration. Growth studies include work with growth-regulating substances, movement in plants, e.g., the movement of water within the plant or the translocation of substances. Nutrition studies involve the uptake of water and mineral solutes, assimilation, and translocation; the physiological aspects of nutrient deficiencies, their diagnosis, and correction; and the water relation of plants and transpiration. Reproduction work includes the study of flowering and fruiting, seed formation, dormancy, the biochemistry of germination, external conditions affecting germination, and vegetative development and propagation. Respiration studies include factors affecting the osmotic and chemical processes by which a plant or its tissues absorbs oxygen and gives off the products, e.g., carbon dioxide, water, and heat formed by the oxidation occurring in the tissues.

Plant physiologists are primarily concerned with activities taking place within the plants themselves. Obviously, however, they must consider the ways in which such activities depend upon circumstances outside of the plant. In other words, environmental factors influencing plant life may be their area of expertise, since the connection between internal and external events is so close that no real separation can be made. Work in this field includes acclimatization studies and stimulation or irritability studies.

Plant physiologists may also work in the field of marketing, storage, and transit problems. This work mainly concerns studies and investigations related to the preservation or deterioration of perishable harvested crops. Specific studies relate to the effect of humidity, temperature, sunlight, atmosphere, storage, and other conditions on a vital physiological function of the plant or plant product.

TITLES

The basic title for all positions in this series is "Plant Physiologist." Positions which include significant supervisory responsibilities and require supervisory qualifications are identified by adding the Prefix "Supervisory" to the basic title.

DETERMINING GRADE LEVELS OF POSITIONS

Practically all, if not all, positions in this series are engaged in the performance of basic or applied research in the field of plant physiology and should be evaluated by reference to the material contained in the Research Grade Evaluation Guide. The few remaining positions are usually supervisory in nature, require the assumption of substantial administrative or program responsibilities or involve the review and evaluation of research material or similar data. In most instances, these remaining positions require research competence also, because they involve the direction or coordination of the performance of research. Since there are so few nonsupervisory nonresearch positions, the establishment of grade-level criteria for their evaluation was not considered practicable.

Among the published standards that may be used as cross references in the evaluation of nonsupervisory nonresearch positions in this series are those developed for the Agronomy Series, GS-0471; and the Chemistry Series, GS-1320.

The General Schedule Supervisory Guide should be used to evaluate positions which include important supervisory responsibilities.