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FEDERAL-GRANT RESEARCH

at the

STATE AGRICULTURAL

EXPERIMENT STATIONS

Projects in

SOILS

Part 21, Section a

Soil Chemistry and
Microbiology

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

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I. CHEMISTRY

A. Soil Reaction, Ion Exchange and Availability of Nutrients

Ariz. A Study of the Effect of Temperature Variation on Various Chemical and Physical Soil Properties Which Affect Fertility. To study the effect of temperature variations on the chemical & physical properties of soils. Effect of: temperature on chemical equilibria utilizing ion exchange resins, clay suspensions, & soils; soil chemical reactions influenced by temperature on plant & root growth; temperature on soil physical properties; natural & artificial shading of soils on plant growth, & root growth.
Agr. Chem., Soils 289

Calif. Lysimeter Investigations of the Gains, Losses, and Transformations of Mineral Elements in Irrigated Soils. Study effects of acid, neutral & alkaline-forming N fertilizers, cropping & irrigation on yields, properties of soils, & gains & losses of mineral elements in soil or added to soil.
Soils, Plant Nutr. 987

Calif. Fixation and Availability of Cations and Anions in Soils; Chemical and Nutritional Aspects. To investigate (1) fixation of cations in non-replaceable form, study of fixation by various soil minerals, effects of grinding, etc.; (2) equilibria between cations held in replaceable and non-replaceable forms and those in the solution phase; (3) absorption of cations by crops with special emphasis on the relation between absorption by plants and the capacity of the soil to absorb cations; (4) fixation of anions with references to iron, aluminum, calcium and other bases; (5) penetration of anions into soil as influenced by chemical and physical nature of the carrier; and (6) absorption by various species of plants of fixed anions from soil.
Plant Nutr. 1023

Calif. Micro-Elements in Relation to Crop Growth - 1. Absorption of Micro-Elements by Plants and Physiological Functions. To study (1) absorption of zinc, copper and other micro-elements by different species of plants under controlled water culture conditions; (2) effects of zinc deficiency on cytology of cell; (3) effects of manganese, copper and other micro-elements on utilization of ammonia and nitrate nitrogen and on the respiration of plants, grown under controlled water culture conditions; (4) interrelations between certain phytohormones and micro-elements; (5) relation of quality and intensity of light to function of certain micro-elements; and (6) new micro-elements essential to plant growth.
Soils, Plant Nutr. 1024

Fla. The Role of the Major Bases in Florida Soils. To determine interrelationships of K, Ca, Mg, and Na in Florida soils and their relation to soil pH, exchange capacity and availability of minor elements under various cultural practices and cropping systems. Field plot tests, lab experiments and tests in commercial fields will be designed to determine (1) rates of leaching of potassium from soil and factors affecting its retention; (2) rates of leaching of calcium and magnesium from soils as related to pH, base exchange capacity and form used -- soluble salts or liming materials; (3) investigation of new and improvement of established analytical methods including referee cooperation; (4) effect of various base concentrations in soil on concentrations of bases in plant tissue and growth of the plants; and (5) effect of bases and pH on availability in the soil and the assimilation by the plant of various nutrient elements.
Soils 598

Ill. Ion Transport Mechanisms in Soils. (1) To study rate of diffusion as a function of moisture and other soil parameters and diffusion of ions in absorbing and non-absorbing media; (2) study mass transport of ions thru porous media as in flowing water; and (3) apply above information to leaching of nutrients and feeding of plant roots.
Agron. 15-368

Ind. The Effect of Oxygen Tensions and Plant Nutrients on Nutrient Uptake Root Development. (1) Study effects of ionic concentration and ionic activity on nutrient uptake. To learn effects of; (2) O tension on rate and amount of uptake of other ions from a mono-salt solution and suspension; (3) amount of surface area or exchange capacity of collodial material in root medium on uptake of ions at various O tensions; and (4) learn O tension at which plants fail to grow when grown at constant temperature and light in a standard medium.
Agron. 886

Ind. The Mobilities of Ions in Clay Systems. Learn mobilities of ions in clay systems. Make pastes of Wyoming bentonite clay by mixing powdered M-clay with solutions containing different concentrations of the Salt MX, where M represents the lithium, sodium or potassium cation and X represents the chloride, bromide or iodide anion. Pack pastes into plastic cylinders and equilibrate in solutions of same concentrations as those used in making the pastes. Learn activities of MX in pastes by measuring the concentrations of the salt in the supernatant solutions.
Agron. 878

Ind. An Investigation of the Effects of Potassium and Phosphorus Deficiency on Nitrogen Metabolism in Plants. (1) Learn effect of K deficiency on free amino acid distribution of plants; (2) effect of K and P deficiency on free amino acid content and relative amount of plant protein fractions; and (3) test for presence of the Krebs urea cycle in higher plants with aid of C^{14} labeled glutamic acid.
Biochem. 899

Kans. Availability of Plant Nutrients in Certain Kansas Soils. To (1) determine potash status of Kansas soils, and factors affecting K fixation and release; (2) study supply of iron, boron and manganese and ascertain factors affecting the supply; (3) determine amount of available phosphorus; (4) evaluate chemical procedures for determining available forms of P, N and K and lime requirements; and (5) make chemical analyses of soils and plants that are desirable to interpret results from greenhouse and field tests.

Agron. 269

Mass. The Influence of Base Exchange Capacity and of Exchangeable Ions in Soils on the Availability of Potassium and Other Cations. To (1) obtain fundamental information on influence of base exchange capacity of soils upon availability of various cations to plants; (2) determine influence of complementary exchangeable cations on availability of various other cations to plants; and (3) determine effect of cation exchange capacity of the plant roots of different plants upon uptake of various cations by the plants and find if this property of plant roots may determine "feeding power" of various plants and account for persistance of one species over another when grown together.

Chem. 27

Mo. Nutrition of Vegetable Crops. - a. Response of Vegetables to Established Cationic Saturation Levels on Low Exchange Soils. To continue investigation of comparative yield response of several vegetables on Lintonia fine sandy loam the exchange complex of which is differentially saturated with respect to cations Ca, Mg, K and H; (2) determine extent to which soil amendments applied last year have changed relative cationic saturation of exchange complex on Lintonia fine sandy loam; and (3) establish more definitely the relationship between exchangeable potash at concentrations over 300 lb. per A and response of certain vegetable crops on calcium-laden river botton soils.

Hort. 196

Mo. Energetics of Ionic Relationships in Soils and Plants. To (1) learn desirable and undesirable balances between major nutrient cations of soil in terms of energy relationships between the cations; (2) learn energy levels at which NH_4 and Na in soil interfere with the K, Ca, and Mg nutrition of the plant; (3) learn extent that energy level of H affects energy levels of Fe and Mn in soil; (4) learn energy relationship between Fe and Ca, and Mn and Ca as they affect the cationic nutrition of plant; (5) evaluate relative amounts of cations needed in different kinds of soils to establish desirable energy relationships; and (6) learn extent to which nutritional balances of soil as expressed by energy relationships are transmitted to the growing plant.

Soils 263 Coop. USDA

Mo. The Fertility Level of Missouri Soils. To clearly comprehend the facts of plant nutrition via the soil, in the light of basic principles for better soil management. Attack will be along 3 lines; (1) chemodynamics and thermodynamics of nutrient uptake by plants from clay of the soil; (2) nutrient uptake of reserves of primary & secondary minerals in soil to nutrients available and their uptake by crops; and (3) penetration of plant roots according to physical and fertility conditions of deeper soil horizons.
Soils 207

N.J. Use of Radioisotope Techniques in the Study of Major and Minor Nutrient Elements in Plants and Soils. (1) Clarify mechanism of, & factors affecting foliar absorption of major & minor plant nutrient elements; (2) study different effects of adding $MnSO_4$ to different agricultural soils of state; and (3) study efficiency of water use of various plant species receiving irrigation (use radioactive water).
Soils 637

N.Y. (Cornell) Reactions of Phosphatic Fertilizers in Soils. To determine what factors control the concentration of phosphate in the soil solution and to correlate the phosphorus uptake by plants with the equilibrium concentration of phosphate in the soil solution.
Agron. 44-4

N.Y. (Cornell) Chemical Reactions of Ammonia in Soils. Study utilization of ammoniacal forms of N by plants as influenced by exchange adsorption & fixation of ammonia by soils with especial reference to chemical reactions of anhydrous ammonia in soils. Attempt to study simultaneously sorption rates & sorption equilibria of ammonia gas in soils as a function of partial pressure of ammonia & the soil moisture content using a modification of the constant volume Warburg manometric apparatus.
Agron. 44-5

N.C. Ionic Reactions in Clay and Soil Systems. To (1) investigate cation-exchange equilibria in various clay and soil systems as to a. describing and predicting distribution of cations between solid and solution phases, and b. investigating theoretically and experimentally energies of ion exchange in clay and soil systems; and (2) study membrane equilibria in clay and soil systems, including measurements of a. ion distributions across a membrane separating a soil or clay paste or suspension from its equilibrium dialysate, b. membrane potentials, c. single ion activities, d. osmotic pressures and freezing points, and e. conductivities.
Soils H-115

Ohio — Factors Affecting Growth and Mineral Absorption by Plants. 1. Relative Significance of Degree of Base Saturation of the Colloidal Soil Complex and the Total Quantity of Bases Present in the Soil in the Absorption of Mineral by Plants. To evaluate the relative significance of the quantity factor or total amount of the ion present, and the intensity factor, or concentration of the ion on the exchange complex, in the absorption of minerals by plants, with particular reference to calcium, magnesium, and potassium.

Agron. 1-1

Ohio — Factors Affecting Growth and Mineral Absorption by Plants. 2. The Influence of Hydrogen Ion Concentration in the Absorption of Minerals by Field Crop Plants. To interpret the effects of hydrogen ion concentration on plant growth when other factors of the nutrient media are held constant.

Agron. 1-2

Ohio — Ionic Interactions in Soils and in Systems of Plant Roots in Relation to Nutrient Uptake. (1) Characterize clay & organic fractions in representative Ohio soils; (2) study exchange properties of soils & separate constituents using clay membrane electrodes to learn ionic interrelation in several cation combinations; (3) learn exchange properties & ionic interrelationships of plant roots, so comparison can be made with above; and (4) correlate nutrient uptake as revealed by plant analysis with ionic interrelation in roots & growth media.

Agron. 165

Oreg. — Chemical Properties of Acid Soils in Western Oregon and Their Relation to Plant Growth and Nutrition. (1) Characterize chemical properties of some of major soil series or other units of classification of Western Oregon and colloidal constituents of these soils; and (2) relate chemical properties to their influence on plant growth and nutrition. Includes study of buffering, exchangeable H, and Al, and ion exchange.

Soils 254

Texas — Factors that Influence the Nutrient Availability of Soils. To study (1) by chemical methods the factors which influence capacity of typical Texas soils to supply nutrient elements, both natural and applied, to plants grown in experiments in the greenhouse or field; (2) by chemical methods the effect of various soil factors on capacity of soil to change added fertilizer constituents to chemically insoluble or biologically unavailable soil compounds; (3) chemically, Texas soil profiles as to total nutrients present, and availability of those present to plants; (4) localized nutritional unbalances due to either a toxicity or a deficiency of an essential nutrient for normal plant growth and development; and (5) effect of varying nutrient supplies on chemical qualities of plants.

Agron. 961

Wash. The Availability of Potassium in Western Washington Soils. To (1) evaluate Western Washington soils by relative ability to release potassium under controlled conditions; (2) determine soil properties affecting potassium needs; (3) devise, if feasible, methods suitable to rapid characterization of soils as to ability to release potassium; (4) correlate measures of potassium release with potassium uptake by cropping under controlled conditions; and (5) evaluate exchangeable potassium supplying power of Western Washington soils.
Agron. 902

For more information on research in this category, see Section b, I. FERTILITY AND FERTILIZERS.

B. Soil and Plant Analyses; Methods

Alaska Alaskan Soil Fertility Levels as Indicated by Rapid Soil Analysis. To (1) correlate rapid soil testing techniques with plant growth responses, particularly as to N, phosphate and potash; (2) develop and adapt reliable quick tests for minor elements; and (3) correlate minor element quick tests with plant growth responses.
Soils Sci. 1

Hawaii The Form of Nitrogen in Grasses Following Nitrogen Fertilization. To (1) determine forms and distribution of N in Panicum and Napier grasses; and (2) study relationship of N to phosphorus and potash in Napier grass.
Soils, Agr. Chem. 622.5

Ill. Methods in the Spectrographic Analysis of Soils and Plants for Minor Elements. To (1) develop rapid, accurate, and reproducible methods for determination of Cu, Zn, Mo, Co, and Fe; (2) investigate fully the possibility of direct examination of the minor elements in plant; and (3) study solution techniques in spectrographic analysis.
Agron. 15-361

Ill. The Composition and Chemical Nature of Soil Organic Matter. To determine (1) chemical nature and composition of soil organic matter; and (2) how the chemical nature and composition of soil organic matter is influenced by composition of parent plant material, type of inorganic colloid found in the soil, manurial and fertilizer treatments, and other management procedures.
Agron. 15-395 (NC-17)

Ind. Evaluation of Soil and Plant Tissue Tests for the Prediction of Crop Nutrient Requirements. To (1) investigate correlation of soil tests for available phosphorus and potassium with crop responses in field and greenhouse; and (2) correlate tissue tests for N, P, and K, on crops grown in the field with crop response to fertilizer applications.
Agron. 696 (NC-16)

Iowa The Improvement, Calibration and Use of Chemical Tests for Determining the Fertilizer and Lime Needs of Iowa Soils. To (1) correlate soil testing procedures with responses obtained from field fertilizer studies; (2) study procedures and techniques for determining lime requirement and readily available nitrogen, phosphorus, potassium, and possibly other nutrients in order to increase accuracy and rapidity of making tests; (3) investigate various field sampling methods to determine procedures to give most representative samples for analysis; (4) study influence of time of year and previous cropping history on results obtained in testing soils; and (5) summarize, analyze, and interpret data on large number of soil samples submitted by farmers to the soil testing lab.
Agron., Soils 1190

Ky. Evaluation and Revision of Sampling Methods and Procedures in Chemical Analyses of Soils and Crops. (1) Improve sampling techniques of plant materials; and (2) find and adapt simpler, faster and more accurate methods of determination of K, Ca, Mg, Mn, B, P, and N in soils and plants of Kentucky.
Agron., Agr. Chem., Soils 161

Md. Study of Soil Tests to Improve Their Accuracy and Reliability. (1) Improve soil test thru study & development of new & better techniques; and (2) learn conditions influencing reliability of tests and make correlation with crop growth.
Agron. O-55

Mich. Development and Standardization of Methods of Determining Nutritional Requirements of Fruit Crops. To establish reliability of plant analysis as a method of determining nutritional requirements of fruit crops.
Hort. 54

Mo. Soil Tests and Fertilizer Response. To improve correlation between soil tests in the lab and field response to soil treatment.
Soils 229

Miss. Correlating Soil Test with Vegetable Crop Growth and Yield Response to Added Fertilizers. To learn influence of various P and K applications on yield in different soil types of various known fertility levels prior to treatment so that a plant response - soil fertility relationship will be used as a basis for fertilizer recommendations.
Hort. HZ-1

Miss. The Development of Chemical Methods for Diagnosing Mineral Deficiencies in Mississippi Soils. To determine the exacting solution or solutions which remove quantities of P and K from soils that are most nearly comparable to the P and K levels as determined by crop response to fertilization; study the effect of internal drainage differences, past management practices, depth of horizons, soil reaction, organic matter content and base exchange capacity on the accuracy of chemical tests in diagnosing P and K requirements; explore the relationship between percentage base saturation and the utilization of exchangeable K by plants; study importance of anion exchangeable phosphates in plant nutrition.

Agron., Soils HD-7

Mont. Determination of Magnesium in Plant Materials by Flame Spectrophotometry. To (1) determine quantitatively effects of common anions on magnesium flame intensities; (2) determine quantitatively effects on common cations on magnesium flame intensities; and (3) incorporate results obtained into an effective, rapid procedure for routine determination of magnesium in plant materials.

Chem. 57 M.S. 933

Mont. Phosphate Equilibria in Soils. (1) Investigate different methods for producing a reproducible metal, metal phosphate electrode, or a reproducible membrane electrode sensitive to phosphate ions; and (2) use such an electrode in fairly simple systems of Ca and phosphate ions and solid Ca compounds, and if successful adapt electrode to more complex systems and finally to soils.

Chem. CR 59 M.S. 966

Nev. Methods of Assessing Soil Fertility Levels. Obtain improved methods of testing soils for N, P, and K, with major attention given to P; and (2) develop method of plant analysis which will indicate an existing level of available nutrients in field.

Soils, Plant Nutr. 18

N.J. Evaluation of Greenhouse Soil Testing Methods. To learn (1) method of analysis most suitable for evaluating available nutrient content of a wide assortment of greenhouse soils; and (2) extent of variation in available nutrient content caused by methods of sampling, rate of watering & leaching the soils; time of sampling with reference to time of watering, effect of applications of fertilizer materials on displacement of nutrients from soils.

Hort. 336

N.J. The Determination of Potentially Available Nitrogen in Soils. (1) Develop a rapid chemical method for learning potentially available N in soils; (2) test method by soil nitrification studies conducted under lab. conditions, & by plant growth studies in potted soils in greenhouse; and (3) calibrate method for use on field soils by field experiments with applied N salts on corn & wheat.
Soils 627

N.J. Spectrochemical Analysis of Soils. To develop methods for spectrochemical analysis of soils, and apply such methods to existing problems in the soils field.
Soils 629

N.J. Correlation of Results of Soil Tests for Mg, P, and K With Plant Growth Response. (1) Measure crop responses to varying established levels of Mg, P, and K; and to additions of Mg, P, and K fertilizers at existing varied soil levels of these elements; relate soil characteristics to soil test results and to crop response to Mg, P, and K amendments; and (2) increase reliability of soil test by examination of lab. procedures in view of results obtained in (1) above.
Soils 630

N.Y. (Cornell) A Study of the Relation Between Some of the Physico-Chemical Properties of New York Soils and Their Response to Fertilization. To study, in a thorough, fundamental way, the conditions under which the more important soil types of New York give a profitable return from the application of fertilizers, and to adapt and develop sufficiently rapid and reliable chemical methods that can be used for the estimation of the fertilizer needs of soils.
Agron. 44

N.Y. (Cornell) Leaf and Soil Analyses in the Diagnosis of Fertilizer Problems of Fruit Plants. Make a critical evaluation of chemical analyses of leaf and soil samples as a basis for diagnosis, and prediction of fertilizer needs of individual fruit plantings of New York. Take leaf and soil samples and observations from apple, sour cherry, peach orchards and from grape vineyards. Obtain similar information from representative sweet cherry, pear, quince, currant, strawberry, and raspberry plantings. Each year take leaf and soil samples from identical locations by a standard procedure and analyzed for N, K, P, Ca and Mg, and in some cases for B, Mn and other minor elements.
Pomol. 194

N. Dak. Laboratory Tests for Soil Phosphorus in Relation to the Response of Field Crops to Phosphorus Fertilization. To (1) relate results of lab tests for soil phosphorus to response of crops upon phosphorus fertilization; and (2) devise tests by which to characterize capacity of various soils to furnish phosphorus to farm crops.
Soils 15-2

Ohio — Use of the Spectrograph for Analysis of Soil Extracts and Plant Materials. To develop spectrographic techniques for analysis of soil extracts, extracts of coal strip-mine spoil material, and plants.
Agron. 87 Coop. ARS

Oreg. — Development, Improvement and Calibration of Soil Tests to Determine the Fertility Status of Oregon Soils. 1. Development and Calibration of a Nitrogen Test for Oregon Soils. To (1) develop an adequate method of testing soils for N; and (2) calibrate N test with crop responses.
Soils 173-1 Coop ARS

Pa. — The Use of Surveys to Determine "Optimum Values" of Nutrient-Element Leaf Concentrations. To determine leaf concentrations of various essential elements in major horticultural crops which are associated with desired responses as affected by fertilization, soil, and climatic conditions.
Hort. 874-A

Pa. — Nutrient-Element Deficiencies in Horticultural Crops. To study (1) use of leaf analyses in confirming visual diagnosis; and (2) value of various nutrient-containing materials in correcting these symptoms when applied to soil or as foliage sprays.
Hort. 874-B

Pa. — The Effects of Differential Nitrogen and Potassium Fertilizer Treatments on Leaf Analysis, and Yields and Quality of Apples. (1) Develop accurate nutritional standards for apple trees through use of leaf analysis; and (2) establish a basis for sound fertilizer recommendations in apple orchards in important fruit growing areas of Pennsylvania.
Hort. 874-D

P.R. — Nutritive Status of Sugarcane by Foliar Diagnosis. Learn relation between content of N, P, K, or other elements in tissues of cane and relative yields (percentage which actual yield of crop is of maximum yield obtained with heavy applications of a nutrient to the soil) of the cane represented by said plant tissue samples considering; (1) What part of plant is most suitable; (2) when tissue samples must be taken; (3) influence played by climate and (4) influence of variety and soil.
Agron., Hort. 30

P.R. — Foliar Diagnosis for Pineapples. Learn relation between content of N, P, and K, or other essential elements in suitable tissues of pineapples and the "relative yields" of the pineapple represented by said plant tissue samples considering; (1) what part of plant is most suitable; (2) when tissue samples must be taken; (3) influence played by external factors; (4) influence variety and soil; and (5) what mathematical equation best approximates relation between plant nutrient content and relative yields of said crop.
Agron., Hort. 116

Wash. X-Ray Spectrography of Soils and Sediments. (1) Apply the X-ray spectrographic method to the elemental analysis of soils and sediments; and (2) test elemental ratio method as a replacement for petrographic determination of resistant minerals as indicators of genetic relationships between horizons.
Agron. 1374

W. Va. The Correlation Between Various Laboratory Methods of Determining available Nitrogen in Northeastern Soils and the Responses to Added Nitrogen of Crops Grown on These Soils in Greenhouse and Field Studies. (1) Examine and develop lab. methods for learning ability of soils to supply N to plant through growing season; (2) correlate results of lab. analysis for available N with responses obtained from crops to added N, when grown in greenhouse; and (3) where lab. and greenhouse studies warrant, make field studies of response of crops to added N.
Agron.and Genet. 112

C. Mineralogy

Ark. Interrelationships Between the Mineralogical, Physical and Chemical Properties of Representative Arkansas Soils. To (1) separate clay and organic matter fractions from agriculturally important soil series, also identify and characterize the various components of these soils by determination of mineralogical and chemical composition of the inorganic and chemical composition of the organic portions; (2) learn physical properties of the selected soils and characterize their affect upon growth and development of plants; (3) learn fundamental factors responsible for development and maintenance of physical conditions in soils which may be detrimental or beneficial to plants. Examine role of components in soils that may affect pans, dense layers, cemented layers, and/or dispersed soils; (4) learn exchange properties of constituents of selected soils by means of clay membranes and ion exchangers and investigate ionic interrelationships of pure, separated, and combined constituents; and (5) learn exchange properties and ionic interrelationships of plant roots to correlate nutrient uptake of plants with ionic interrelationships and physical behavior in soil environment in greenhouse and field.
Agron. 342 (S-14)

Calif. A Study of the Colloidal Constituents of California Soils. To study (1) amounts, distribution, and kinds of colloidal substances found in representative California soil profiles; (2) chemical composition; (3) X-ray analysis and crystal structure; (4) optical properties; (5) ion exchange properties; (6) moisture relations and dehydration properties; and (7) effect on plant growth.
Soils, Plant Nutr. 836

Calif. Investigation of Mineralogical Associations in California Soils as Affected by Pedological Factors and Their Significance in Detailed Soil Classification. (1) Aim clay mineral investigations toward direct support of soil surveys in state in classification and correlation operations; and (2) conduct secondary investigations with fundamental aspects of clay mineral formation from primary parent minerals, their stability under different environmental conditions and their properties.
Soils, Plant Nutr. 1754 Coop. SCS

Fla. Mineralogical Properties of Representative Florida Soils. Identify the mineralogical character and ascertain chemical and physical properties of inorganic colloid and silt fractions in representative Florida soils.
Soils 347 (S-14)

Hawaii The Identification of the Secondary Minerals Developed Under the Tropical Soil Weathering Occurring in the Soils of the Hawaiian Islands. To separate and identify the actual compounds or chemical identities present in the colloids of representative soils.
Soils 130

Ill. Characterization of Loess in Illinois. (1) Learn mineralogical composition and chemical and physical properties of loess derived from different sources; (2) establish the origin of clay minerals found in loess; and (3) develop improved methods for determining size distribution and other physical characteristics of silts and clays.
Agron. 15-366

Kans. A Study of Soil Clay Minerals and Their Decomposition Products and the Effect of Soil Solution on their Formation and Disintegration. To study the decomposition and recombination of the decomposition products of soil clay minerals, including a study of soil conditions required to form specific minerals, from the disintegration products resulting from weathering.
Phys., Chem. 229

Md. Mineralogical Studies of Maryland Soils. To (1) originate study of varieties and proportions of minerals in important Maryland soils; (2) study factors responsible for formation of Maryland soils and effect on soil fertility and productivity; and (3) improve present methods of mineralogical analysis in view of obtaining more accurate quantitative determinations of clay minerals.
Agron. O-54 Coop. SCS, USDI-Geo-Svy.

Miss. The Chemical and Mineralogical Properties of Soils in Relation to Soil Development. To determine (1) occurrence and distribution of clay minerals in selected soil series; (2) exchange properties and other chemical and physical characteristics of different soil separates of selected soil series; (3) relation of chemical properties and mineral constituents to soil development and the usefulness of these properties in soil classification; and (4) relation of chemical properties and mineral constituents to potassium and phosphorus fixation and release in those soil series on which fixation and release studies have been completed.
Agron. RRFD-3 (S-14)

Mo. The Characteristics and Development of Heavy Clays in the Soils of Missouri. To broaden and deepen our knowledge of the nature of clays in soils, and of their mode of formation by electrochemical characterization of pure clay minerals and mineralogical and chemical work on silt and sand fractions.
Soils 6

Pa. The Relationships of the Mineral Composition of the Soils of Pennsylvania to Their Agricultural Value. To (1) determine relation of various clay minerals in Pennsylvania soils to fixation and release of K; (2) structure of clay minerals instrumental in fixation processes; (3) means of application of K as a fertilizer taking into account fixation capacities of soils to attempt to bring about more economical use of K by plants; (4) distribution and kind of feldspars in soils and relation of these minerals to their potential productivity; and (5) evaluate trace element content of feldspars in Pennsylvania soils.
Agron. 1193

Tenn. The Influence of Chemical, Physical, and Mineralogical Properties of Soils on Nutrient Availability and Plant Growth. (1) Learn chemical, physical, and mineralogical properties of profile samples from some of the major agricultural soils of state and region; (2) relate above properties to nutrient fixation and release to plants; (3) study reaction of fertilizer materials with soils having different chemical and mineralogical properties and their relation to nutrient availability to plants.
Agron. 55 (S-14)

Texas The Mineralogical and Chemical Properties of Soils and Their Relationship to the Physical Properties of Soils, Soil Fertility, and Soil Development and Morphology. To (1) inventory the mineralogical composition and chemical properties of selected soils; (2) study relationship of mineralogical composition to chemical and physical properties of the soil; (3) evaluate mineralogical composition of soil as it relates, in general, to availability or non-availability of plant nutrients, with emphasis as it relates to K, NH_4 and P fixation; and (4) use results obtained as supplementary information in classifying soils as well as further our concepts to soil development and morphology.
Agron. 928 (S-14)

Wash. Chemical and Mineralogical Properties of Claypan Soils and Related Normal Soils of the Prairie-Forest Transition Zone of Eastern Washington. (1) Characterize soils of area through profile analysis; (2) develop concepts of soil-forming processes under variable climatic, biotic, and topographic influences represented in area; and (3) fit these soils into the American system of soil classifcation.
Agron. 1318

For more information on research in this category, see Section c, III. GENESIS, MORPHOLOGY AND CLASSIFCATION.

II. MICROBIOLOGY

A. Nitrogen Fixation and Transformations

Ala. Factors Affecting Microbiological Transformations of Nitrogen as Related to Efficient Utilization of Legumes and Fertilizer Nitrogen in Southern California. To learn (1) factors influencing persistence of N fixing bacteria in soil and establishment and maintenance of symbiotic relations between organisms and roots of host legumes; and (2) influence of soil and climatic factors on rate and magnitude of N transformations, with reference to mineralization from organic forms, nitrification, denitrification, leaching losses, and non-symbiotic fixation.
Agron., Soils 574 (S-35)

Ariz. Fixation of Nitrogen in Semi-Arid Soils. (1) Identify soil algae responsible for N fixation in semi-arid soils; (2) study habits of algae fixing N in pure culture & mixed culture, as found under normal circumstances in rain-crust of soils; (3) learn factors influencing the fixation of N in soils under lab. & field conditions; (4) make microscopic examinations of surface crust, involving identification & isolation of N fixing algae, with main effort centered around soil algae; (5) make interrelationship & associative studies between algae & soil fungi involved in N cycle under controlled conditions in lab. where photosynthesis is more favorable; and (6) conduct N balance studies on citrus orchard soils to learn long-time build-up of N under different cultural practices.
Agr. Chem., Soils -- (W-31)

Calif. Biological Decomposition of Nitrogen-Organic Matter Complexes and Chemical Fixation of Ammonium Nitrogen by the Soil Organic Fraction. To learn (1) relative availability of N fixed in complexes resulting from chemical reaction between soil organic matter & fertilizer N; and (2) reaction between inorganic N compounds & soil organic matter involving fixation of N in an insoluble & non-exchangeable form.
Soils, Plant Nutr. 1723 (W-31)

Fla. Factors Affecting the Establishment, Activity and Persistence of Rhizobia in Soils. To study factors in introduction, effectiveness and persistence of root nodule bacteria in soils with emphasis on the more important legume crops.
Soils 702 Coop. USDA

Ga. Effects of Low Temperatures on Nitrification of Ammonia in Soils. (1) Learn effects of temperature in range 30°F. to 50°F. on nitrification of NH_3 in soils; (2) compare nitrification characteristics of NH_3 & certain ammoniacal salts at low temperature; (3) compare soil pH changes resulting from nitrification of NH_3 & certain ammoniacal salts at low temperature; & (4) learn influence of soil type & related characteristics on rate of nitrification of ammoniacal materials at low temperature.
Agron. 47

Idaho — Ecological Factors Influencing Free-Living Nitrogen-Fixing Organisms in Certain Northern Soils. To determine (1) activity of free-living N-fixing microorganisms in N.W. soils; (2) nutritional requirements of these organisms; and (3) influence of ecological factors in activity of N-fixing organisms.
Bact., Agr. Chem. 214

Ill. — Biological Nitrogen Fixation by Symbiotic and Nonsymbiotic Nitrogen-Fixing Microorganisms. To (1) establish contributions of each of symbionts, rhizobia and leguminous plants, to symbiotic N-fixation process; (2) determine importance of inoculation of leguminous crops grown on soils where nodulated crops have been previously; and (3) evaluate importance of soil organic matter in nonsymbiotic nitrogen fixation in soils.
Agron. 15-391

La. — Microbiological Gains and Losses of Nitrogen in Soils. To study (1) in the field, relation of various cropping practices to supply of N and influence of cropping practices on accumulation or depletion rate of N and organic matter content of soils and loss of N by leaching; (2) influence of various cropping practices on numbers of non-symbiotic N-fixing bacteria and value of these microorganisms in adding N to soil; (3) isolate from soils microorganisms capable of living on N-free medium and at different oxygen tensions and to study their N-fixing capacity in pure and mixed cultures; (4) study in greenhouse effects of artificial inoculation of seed, lime, phosphorus, and potassium on symbiotic N fixation, nodule formation and protein content of certain legumes grown in soils of the lower Mississippi flood plain and terraces; and (5) study in the lab the mechanisms involved in gains and losses of N in these soils.
Soils 596

Minn. — The Activity of the Rhizosphere Population in Transformations of Nitrogen Within the Root Zone as Related to the Nutrition of Plants. To clarify the action of the rhizosphere population in the transformations of N within the root zone and the relation of these transformations to the N nutrition of plants.
Soils 2515

Miss. — Nitrification and Fixation of Ammonia in Soils. To determine (1) extent and conditions under which ammonium nitrogen is fixed in a form which is unavailable to plants; (2) combined effect of temperature and soil reaction on rate of nitrification of ammonia; (3) relationship between ammonia retaining power and lime requirement of soils; and (4) loss of N applied as anhydrous ammonia after varying periods of time following application.
Agron. HD-2

Miss. The Nitrifying Capacity of Some Mississippi Soils During Various Seasons. To learn (1) nitrifying capacities of representative soils by seasons; (2) effect of addition of various sources of NH_4 nitrogen and organic residues on rate of nitrification; and (3) effect of soil pH on nitrification.
Agron. HD-9

Miss. Factors Affecting Microbiological Break-Down of Organic Matter and Nitrogen Transformations in Southern Soils. Learn (1) rate and nature of microbial decomposition of various plant residues in soils and resultant effect on N status of the soil; (2) effects of the principal biological factors on mineralization, immobilization, and loss of N under diverse environmental and climatic conditions; (3) rate and extent of biological oxidation of ammonia from varying sources at different depths as affected by temperature, aeration, and moisture; and (4) rate and magnitude of biological release of chemically fixed, non-exchangeable ammonia in Southern soils.
Agron., Soils RRFD-1 (S-35)

N.J. Control of the Processes of Microbial Nitrification. Learn how rate of nitrate formation can be increased or decreased in soil. Learn if bacterial growth is limited by deficiency or excess of medium constituents or by products of growth, using chemostat to continuously supply new and remove old medium. Test effects of cyanamide, dicyanodiamide, thiourea and related compounds, mercapto compounds, chromates, and sulfite in inhibiting growth of nitrifying bacteria.
Agr. Microbiol. 402

N.Y. (Cornell) Biochemical Transformations of Soil Nitrogen. To determine effect of low temperatures on biochemical N transformations, and make experiments on nitrification using a modified soil perfusion apparatus which maintains both temperature and pH.
Agron. 45

N.Y. (Cornell) Biological Nitrogen Fixation. Critical tests of cytochrome hypothesis and nature of N fixation inhibition by CO.
Bot. 78

N.C. Soil Transformation of Nitrogen Which Influence Availability to Crop Plants. (1) Study nature, magnitude, and factors controlling microbiological immobilization, mineralization, nitrification, denitrification, volatilization of ammonia, ammonia fixation, hydrolysis of urea and cyanamide, movement of inorganic ions, etc.; and (2) learn influence of above soil transformations of N on availability of N to Southern crops.
Soil 131

N. D. Nitrate Production in the Soil and its Effect on Potato Scab. Learn (1) effect of various amounts and forms of inorganic soil N on development of Potato Scab; and (2) conditions influencing accumulation of a high amount of ammonia nitrogen in soils.
Hort., Agron., Bact. 8-1

Okla. The Influence of Moisture and Organic Matter on the Reduction of Nitrates in Soil. Learn (1) influence of different kinds and amounts of organic matter on reduction of nitrates in soils; (2) influence of soil moisture on nitrate reduction; and (3) interaction of above variables on nitrate reduction. Organic materials are wheat straw, sorghum and alfalfa.
Soils 954 (S-35)

Oreg. Soil Microorganisms Influencing Nitrogen Availability, Nitrogen Balance, and Losses in Semi-Arid Soils. Study of nitrogen losses and nitrogen balance as influenced by nitrogen fertilizers and organic matter additions in semi-arid soils.
Bact. 177 (W-31)

Pa. A More Efficient Rhizobium for Inoculating Birdsfoot Trefoil (Lotus Corniculatus). Improve methods for maintaining inoculum titer in soil; (2) study interactions in soil between rhizobia and other members of soil microflora; (3) obtain strains of rhizobia that will more rapidly cause effective nodulation; and (4) study physiology of symbiotic nitrogen fixation in Lotus corniculatus. Collect from plant isolations and from commercial inoculant producers a wide variety of strains of rhizobia represented to be effective for nodulating Lotus. Produce antisera for strain identification by rapid immunization of rabbits using selected rhizobia strains as antigens. Inoculate Lotus seed with strains of rhizobia using various proteins, lipid, or carbohydrate mixtures to fasten inoculum to seed and to maintain the rhizobia in an active state.
Bact. 1336

Texas Biochemistry of Nitrogen Fixation and Utilization. To obtain further information on specific chemical reactions which take place during fixation of atmospheric N and to reinvestigate role of the plant and role of the bacterium in symbiotic N fixation.
Biochem., Nutr. 830

For more information on research in this category, see Section b, I, B. Nitrogen

B. Soil Borne Pests and Diseases

Ala. The Relationship of Soil Microflora to the Incidence of Disease in Plants. To learn relationships between activities of general soil microflora and pathogenicity of soil-borne plant parasitic microorganisms and to develop biological methods of controlling soil-borne diseases of Alabama crop plants.
Bot., Plant Path. 560 (S-26)

Fla. Identify and Distribution of Soil Nematodes in Florida. To (1) identify the more common species that make up nematode fauna of Florida soils and investigate their comparative abundance in different soil types and in different regions of the state; (2) provide drawings and other information useful in preparation of keys and lab guides, which will aid in recognition and study of species most commonly encountered in Florida; and (3) provide at Gainesville a permanent collection of nematodes and of plant specimens showing nematode injury that can be used as reference material and for teaching purposes.
Ent., Soils 695

Maine The Biology of Low-Bush Blueberry Soils. To investigate the influence of various soil-inhabiting organisms on the blueberry plant and effect of cultural practices on soil-inhabiting organisms.
Plant Path., Agron. 51

Md. Treatment of Soil and Underground Parts of Plants for the Control of Plant Diseases. To study the effects of soil treatment with respect to: (1) control of plant diseases and phytotoxic effects on plants; (2) reaction of non-pathogens to treatment and the interrelationship with disease pathogens and plant growth; (3) methods and techniques for introducing treatments into soil or plant; and (4) effects of treatment on soil types.
Bot. J-93 Coop. USDA

N.Y. (Cornell) The Fire Blight Disease of Pome Fruits and Its Control. 1. Influence of Soil and Cultural Conditions on Disease Development. To determine (1) if soil texture and moisture relations may influence disease development, independent of influence on growth of trees; (2) influence of different nutrient levels and balance on development of disease in trees on soils different in type and moisture, and determine effect of varying soil nutrient balance on disease; (3) influence of different cultural practices as to cultivation, sod culture, and cover crops on disease development; and (4) apply information to reduce disease development in commercial orchards.
Pomol., Plant Path. 129-1

Ohio — Effect of Crop Rotations in the Incidence of Diseases Caused by Soil-Borne Pathogens and Associated Changes in Soil Fungus Populations. To determine (1) effect of rotation on incidence of disease caused by soil-borne pathogens from relative amounts of damping-off and root rots of assay plants; (2) effect of rotations on numbers and types of soil fungi, and to correlate those changes with disease incidence; and (3) host range of soil pathogens on field crops important in Ohio, and study antibiotic and antagonistic relationships, soil types, fertilizers, and organic matter which may affect their pathogenicity.
Plant Path., Bot. 63-1

Oreg. — Relation of Crop Residues to the Development of Certain Root Rot Diseases of Nursery Crops. To learn (1) effect of certain crop residues on development of root diseases of ornamental plants, caused by Phytophthora cinnamoni and P. lateralis; (2) influence of soil temperature and moisture on effects of crop residues in suppressing or stimulating disease development; and (3) if suppression of disease associated with certain crop residues is biological, chemical or physical.
Plant Path. 196 (W-38)

S.C. — A Study of Microbial Antagonisms in South Carolina Soils With Special Reference to Antagonistic Action of Soil Bacteria, Actinomycetes, and Fungi on Certain Soil-Inhabiting Phytopathogens. (1) Learn antagonistic action of some microorganisms isolated from South Carolina soils upon selected phytopathogens; (2) develop means of utilizing antagonistic reactions as means of biological control of some soil-borne plant diseases; (3) survey soil samples from various sources, include the rhizosphere of diseased & healthy plants, if possible, & learn the number of bacteria, actinomycetes, and fungi antagonistic to Sclerotium rolfsii, Rhizoctonia solani, Fusarium spp., Pseudomonas solanacearum, and Pseudomonas tabacum. Study relation of soil pH to presence of antagonistic organisms; and (4) test specific antagonists under greenhouse conditions for their ability to prevent parasitism of the phytopathogens on their host plants in sterile soil.
Bot., Bact. 133 (S-26)

Tenn. — Associations of Soil Microorganisms as Related to Plant Diseases. To (1) determine associations of saprophytic soil microorganisms with pathogenic soil microorganisms which enhance ability to produce epidemics; (2) use antagonistic soil organisms for reducing diseases; and (3) devise crop successions that will thru soil microbiological action reduce ability of semiparasitic organisms to incite disease.
Plant Path. 139 (S-26)

For more information on research in this category, see Part 17, Plant Pathology and Bacteriology.

C. Pesticides and Other Additives

Ark. Determination of Effect of Insecticides on Plants and Soils, Including Bio-Assay of Residues. To determine bio-assay methods of determining insecticide residues on crops and in soil to evaluate effects of insecticides, solvents, diluents, and formulations on plant growth, harvest residues and after effects in the soil.
Ent. 370 (S-22)

Calif. Effects of Fumigants, Insecticides, and Herbicides on Soil Productivity. Learn (1) influence of soil properties and various soil management practices on effectiveness of fumigants, insecticides and herbicides; (2) effect of fumigants, insecticides, and herbicides on chemical, physical, and microbiological properties of soil with special reference to soil productivity.
Soils, Plant Nutr., Ent. 1532

Conn. (Storrs) The Influence of Soil Factors on the Herbicidal Effectiveness of Certain Carbamates. To determine the influence of soil moisture, texture, organic matter content and pH upon herbicidal activity of these carbamates: isopropyl N-(3 chloro-6-methoxyphenyl) carbamate, sec. butyl N-phenyl carbamate; isopropyl N-(3-chloro-6-methoxyphenyl) carbamate, isopropyl N-(3-methylphenyl) carbamate, isopropyl N-(3, 6-dichlorophenyl) carbamate and isopropyl N-(3-chloro-phenyl) carbamate.
Plant Sci. 221 (NE-12)

Del. Control of Phytopathogenic Fungi, Bacteria, and Nematodes in Soils. To control the phytopathogenic organisms which are prevalent in Delaware soils. Determinations include: (1) influence of soil temperature & moisture; (2) killing distances in different environmental conditions; (3) rates of application necessary to control organisms at various soil depths & at various levels of inoculum potential in the soil; (4) effect of chemicals in soil on beneficial flora; & (5) residual effect of chemicals on succeeding crop plants.
Plant Path. 17-P

Ga. Determination of Amounts and Effects of Insecticide Residues on Plants and Soils. (1) Learn insecticide residues on certain important Georgia crops following the use of various insecticides at different rates, formulations and methods of application; and (2) evaluate effects of insecticide residues on plant growth, plant products, and soil.
Ent. 70 (S-22) Coop. ARS

Ga. The Evaluation of Chemical Compounds as Nematocides and Their Phytotoxicity to Agricultural Crops. To (1) test chemicals having prospective nematocidial value for their efficacy on general and select nematode population; (2) develop special soil fumigation methods for different nematode species as different crops may require; and (3) test adaptability of nematocides and soil fumigation methods in cooperation with crop specialists on practical production basis.

Nematol., Agron., Path., Hort. 220 (S-19)

Ill. Fundamental Problems Associated with the Use of Pesticidal Chemicals in Soils. To determine (1) rate at which insecticidal chemicals accumulate in soils under normal usage; (2) plant and animal tolerance for varying degrees of soil contamination; and (3) rate of insecticide loss from soils of varied types and under varied climatic conditions.

Ent. 12-311 (NC-19)

Ill. The Adsorption, Movement, and Effect of Herbicides in Plants and Soils. (1) Study factors affecting adsorption and translocation of herbicides in higher plants; and (2) study residue, movement, and nature of adsorption of herbicides in different soils.

Agron. 15-378

La. The Effect of Chemicals Used in Agriculture on the Soil Microflora. To determine effects of herbicides, pesticides, defoliants, etc., upon the microorganisms present in the soils of Louisiana.

Plant Path., Bot. 837 (S-22)

Maine Effect of Soil Residues of DDT and Toxaphene on Plant Growth. To determine possible toxic effects to potatoes from continued application to soil and to plants of DDT and toxaphene, especially possible effects on flavor or other quality factors, accumulation and persistence of residues in soil, and detection of residues in soils.

Ent., Chem., Agron. 82 Coop. ARS

Mich. The Role and Fate of Herbicides, Antibiotics, Growth Regulating Substances and Other Compounds in Different Soil Types. To study (1) residual effects of herbicides, antibiotics and plant hormones in different soils; (2) find effect of various compounds on microbial flora of soils; (3) find species of bacteria which might prove helpful in aiding disintegration of herbicides; and (4) determine effect of biuret on plant growth, to determine the cause of transformation of urea to biuret, and to determine biuret content of various commercial sources of urea.

Hort., Soil Sci., Bact. 123

Mich. The "Secondary" Effects from Soil Application of Pesticides. To accumulate information on hazards associated with use of pesticides under Michigan conditions, particularly those on soil.
Ent. 451 (NC-19)

Mo. Hazards Associated with the Use of Pesticides. To learn (1) rate of insecticidal accumulation in soils from normal usage; (2) plant and animal tolerance for varying degrees of soil contamination; and (3) rate of insecticidal decomposition in a 4-year rotation in soils following initial applications at normal and excessive rates.
Ent. 283 (NC-19)

N. J. Movement, Persistence, and Activity in Soil of Formulations of Phenoxy, Carbamate, and Substituted Urea Herbicides. To make further research on phenoxy, carbamate, and substituted urea compounds to evaluate movement, persistance, and retention on soil colloids, and to provide basic information on these factors which will assure their satisfactory use.
Farm Crop 257 (NE-12)

N. Y. (Cornell) The Role of Soils in Plant Response to Herbicides. To study (1) influence of soils on fate of herbicides; (2) influence of herbicides on soils; and (3) plant response to herbicides as influenced by the two factors above.
Agron. 55 (NE-12)

N.Y. (Cornell) The Influence of Soil Factors on the Activity of Herbicides. To determine (1) effects of soil moisture, organic matter, texture and related factors on the fate and activity of important herbicides such as the phenoxy compounds, carbamates, ureas, dinitros, etc.; and (2) develop working recommendations for these herbicides over widest possible range of environment.
Veg. Crops 167 (NE-12)

Ohio Pesticidal Residues in Soils Following Pest Control Practices. To study (1) pesticidal accumulations and disintegration in soils of various types following applications for pest control; and (2) effect of pesticidal accumulation in soils upon soil flora and fauna and on the growth, quality, and yield of crops.
Ent. 110 (NC-19)

Okla. The Effect of Additives on Microbial Soil Transformations. To (1) determine effect of DDT, toxaphene, malathion, dieldrin, & 2,4-D on these microbial transformations: denitrification & nitrate reduction, symbiotic N-fixation, non-symbiotic N-fixation, ammonification, nitrification, organic matter decomposition, (2) determine effect of temperature on above listed microbial transformations, & (3) observe stimulation or inhibition of soil microbial population by above compounds.
Bact. 889

Pa. Microbiological Studies. - Weed Control. To (1) determine effect of organic herbicides on activity of soil microorganisms, and (2) study microbiology of decomposition of organic herbicides in soil.
Bact. 1095-G

Texas Effects of Insecticides on Plants and Soils. To determine the effects of benzene hexachloride, DDT, toxaphene and dieldrin on cotton and other crops.
Ent. 946 (S-22) Coop. ARS

W. Va. Factors Affecting the Herbicidal Activity of Some Chemicals Applied to the Soil Surface. To study (1) fundamental relations between soil characteristics on the effectiveness of various herbicides as measured by germination and seedling vigor in the greenhouse; (2) effective rate of application of herbicide under controlled conditions of moisture and pH; (3) influence of above soil characteristics as they affect herbicidal activity of 2,4-D, dinitro's etc.; and (4) persistence of herbicidal activity under controlled soil moisture conditions.
Agron., Genet. 76 (NE-12)

Wis. Fundamental Problems Associated with the Accumulation of Pesticidal Chemicals in Soils. To determine magnitude of insecticidal accumulations in Midwestern soils, rate and reasons for disappearance of typical insecticides from various soil types and effect of soil-borne insecticides on soil flora and non-insect fauna.
Ent. 897 (NC-19)

D. Other Soil Microbial Activities

Ariz. The Nature of Microflora and Their Activity in Arizona Soils as Affected by Soil Temperature, Moisture, Salinity, pH, and Other Factors Peculiar to Semiarid Conditions. To (1) study the influence of temperature and moisture variations peculiar to irrigation practice, salinity, and pH on activity and function of soil microflora; (2) the prevalence and distribution of free-living nitrogen-fixing algae in native desert and irrigated soils with regard to moisture, temperature, salinity, and organic residues; and (3) the distribution and nature of bacteria, fungi, actiomycetes and algae in high salt soils by CO_2 - evolution (respiration) method.
Chem. Soils 283

Calif. Factors Influencing the Re-Establishment of Peach Orchards on Old Peach Soils. To discover and devise methods for preventing the peach replant growth depression. Study development of the virgin orchard on the University replant plot with particular reference to growth rate, behavior of nematode populations, and behavior of microbiological populations.

Pomol. 1126

Calif. Synthesis and Degradation of Organic Compounds by Sarpophytic Bacteria. To study (1) nutrition of microorganisms--including information on the role of specific nutrients, new growth factors & biochemical mechanisms, in synthesis of important cellular constituents; (2) metabolism of nitrogenous compounds concentrating on analysis of biochemical mechanisms in decomposition of specific substrates by organisms now available in pure culture; (3) fatty acid synthesis & degradation by bacterial enzymes--finding precisely how butyric acid is formed from acetic acid & ethyl alcohol, & what enzymes, co-enzymes & other factors participate in the process; (4) methane formation; (5) transformation of carbohydrates & other non-nitrogenous compounds; (6) CO_2 utilization; & (7) N fixation.

Plant Biochem. 1207

Del. The Role of Microbial Gums and Related Materials in the Genesis and Stabilization of Soil Structure. To learn (1) extent & manner in which genesis & stability of soil aggregates are influenced by microbial gums & related substances; (2) cultural conditions influencing production of these substances; and (3) amount & characteristics of these substances as resulting from decomposition of plant residues.

Agron., Agr. Engin. 13-A (NE-11)

Ga. The Microbiology of Crop Residues as Influenced by Nitrogen Additions and Other Management Practices. (1) Relate certain management practices to soil organic matter & resulting effect of soil organic matter on nutrient availability, aggregation & moisture availability; and (2) learn effect of nature and C:N ratio of organic residues on persistence of materials in soils and effect of materials on soil properties.

Agron. 314 (S-35)

Idaho — A Study of the Physiology of Purine-Decomposing Anaerobes Found in the Soil with Special Reference to Organisms Which Decompose Adenine. To (1) isolate several strains of adenine-decomposing anaerobes from various soils, water, muds, etc., using enrichment techniques; (2) describe and classify the organisms, or reconcile their characteristics with Bergey's system of classification of bacteria; (3) determine growth requirements of the organisms; (4) determine activity of the organisms in breaking down purines other than adenine, and determine quantitatively the end-products of breakdown of all purines which are attacked by the organisms; (5) study feasibility of using the organisms for quantitative analysis of adenine and other purines; and (6) investigate intermediate mechanisms of breakdown of adenine by the organisms.
Bact. 206

Ind. — Decomposition of Plant Materials and Formation of Soil Organic Matter. To determine (1) changes in decomposition of plant materials, and in microbial populations, caused by variation of nutrients and other factors, e.g., moisture, plant growth; and (2) effect of temperature on decomposition of organic materials and the variation in organic matter formed under controlled conditions.
Agron., Bot., Plant Path. 707

Ind. — The Effect of Plant Composition, Type of Clay, and Nitrogen Supply Upon the Quantity and Nature of Soil Organic Matter Formed and Its Effect Upon Soil Structure and Productivity. To determine (1) significance of clay type, nature of crop residue, and N supply on fundamental nature and amount of organic matter resulting from decomposition of plant materials; and (2) effect of organic matter formed under different conditions set up in (1) upon soil structure and non-physical factors important to crop yield.
Agron., Bot., Plant Path. 754 (NC-17)

Ind. — Determination of the Role of Soil Microorganisms in the Soil Aeration Requirements of Plants. To learn (1) effect of microorganisms upon aeration needs of plant roots; and (2) effect of aeration upon nature and abundance of microbial flora associated with plant roots.
Bot., Plant Path. 843

Iowa — Studies on Transformations of Nutrient Elements in Decomposing Plant Materials and in Soils, Using Isotopes as Tracers. To (1) determine rate and quantity of nutrient immobilization in decomposing plant residues; (2) study influence of nutrient concentration in residues on total immobilization and progress of decomposition; (3) evaluate effect of various physical factors as moisture, temperature, and aeration, (4) investigate sequence of biological and chemical changes in mineralization; and (5) develop techniques for wider use of isotope tracer elements in mineral nutrient transformations.
Bact., Agron. 1070 Coop. Atomic Research Institute

Kans. — The Role of Surface Phenomena in the Uptake of Nutrients By Soil Micro-Organisms. To learn mechanisms by which microorganisms abstract nutrients from their environment & to study the physical & chemical factors effecting process. Investigate the chemical groupings of the bacterial cell surface responsible for ion exchange process. Determine homogeneity or heterogeneity of adsorption sites by learning ratios of adsorbate & adsorbent. Use of Ca^{45} in exchange studies to detect small differences in ion combining capacities of concentrated bacterial suspensions.
Bact. 465

Minn. — Microbiological Production of Organic Growth Substances Within the Rhizosphere and Effects on Plant Growth. To study microbiological production of organic plant growth substances in the rhizosphere, and possible influence of such growth factors in growing plants.
Soils 2516

Mo. — The Protein Role of Nitrogen in Organic Matter. To (1) study cycles of organic compounds synthesized by alfalfa according to the supply of boron and sulfur in the soil; (2) study uptake of organic compounds by higher plants; and (3) evaluate effects of some organic compounds on soil flora.
Soils 208

Nebr. — Microbiological Studies of Stubble Mulching in the Great Plains. To learn influence of (1) stubble mulching on number & kinds of microorganisms; total count, antinomycetes, fungi, bacteria, anaerobes, denitrifiers, rhizobia, & nematodes; (2) stubble mulching on nutrient element changes in soil by microorganisms; primarily nitrate production & P availability; (3) stubble mulching on formation of decomposition products by microorganisms that affect germination & growth of plants; (4) decomposition products of crop residues in stubble mulch system on soil aggregate stability; & (5) decomposition of crop residues under different methods of management in stubble mulch systems. Find means of speeding up or slowing down decomposition for disposing of heavy residue & retaining light residue.
Agron., Soils 279 Coop. ARS

Nebr. Isolation, Culture and Improvement of Superior Soil Structure Stabilizing Microorganisms. To (1) isolate most effective soil structure stabilizing microorganisms; (2) enhance stabilizing effect of organisms by using best known cultural technique; (3) work toward developing superior strains of organisms by using genetic principles, including irradiation; and (4) study role of microorganisms in soil structure formation, stabilization, and destruction.
Agron., Soils 512 Coop. ARS

N. J. The Decomposability of Tannins and Tannin Complexes. (1) Learn decomposability of complex of tannins & other organic materials; (2) compare decomposability of complexes with that of the tannins & other organic materials separately; (3) learn influence of reaction (pH) & other environmental factors on decomposition of organic materials; (4) decomposability in solution culture media in solid vehicles as sand; and (5) determine liberation of CO_2 & ammonia, as criteria of decomposition. Study decomposition by mixed populations derived from a suspension of a fertile soil.
Agr. Microbiol. 403

N.C. An Investigation of the Types, Numbers, Ecology and Factors Affecting Phagocytosis in Simple Slime Molds Occurring in Cultivated and Uncultivated Soils of North Carolina. To learn importance of simple slime molds as part of soil microflora & their effect upon numbers & activities of microbes associated with them. An attempt will be made to find better & more dependable methods for obtaining cultures of the Acrasieae from soil.
Bot. 37

N.C. Soil Organic Matter Formation, Decomposition and Influence on Productivity in Southern Soils. (1) Measure tie-up & release of N, P, S, & other nutrient elements attending decomposition of crop residues; (2) evaluate extent of soil organic matter formation by rhizosphere decomposition of root exudates & die-back during growth of crop plants; and (3) learn influences of various crop cultural practices, the amount & kind of residue returned, & degree of residue incorporation into soil on the decomposition of residues & organic matter, on microbiological tie-up & release of plant nutrients & in soil moisture intake & transmission.
Soils 107 (S-35)

Oreg. The Role of Rhizosphere Bacteria in the Growth of Forage Plants and the Influence of Organic Residues and Nitrogen Fertilizers on Their Development. To learn (1) if important forage plants have a specific rhizosphere microflora; (2) if microflora is beneficial to plant; and (3) effects of crop residues and N fertilizers on rhizosphere microflora and its influence on selected forage-plant species.
Bact. 282 (W-47)

Pa. Relationship of Microorganisms to Soil Phosphorus. (1) study influence of microorganisms on availability of soil P to plants; (2) evaluate role of microorganisms as reservoirs for soil P; (3) find a cycle of oxidation and reduction of inorganic P compounds mediated by microorganisms; and (4) make isolations from soil to obtain microorganisms which take up P from soluble and insoluble salts of the element.
Bact. 1333

S. C. Investigations of the Microbiology of Crop Residue Decomposition as Influenced by Tillage Practice, Type and Amount of Residue and Fertilizer Treatment Combinations. To learn (1) rate of microbial decomposition of organic material in soil as influenced by tillage practices; (2) influence of different types and amounts of residues and different amounts of fertilizer on rate of decomposition of organic matter and the improvement of soil structure; and (3) influence of tillage and other cultural practices on N transformations in the soil.
Agron. 59 (S-35) Coop. ARS

Va. The Fungus Flora of Agricultural Soils in Virginia. (1) Learn fungus flora of agricultural soils in state; (2) correlate presence and distribution of specific fungi with soil types, crop plants, and other ecological factors; and (3) study role of soil fungi in decomposition of organic materials and in conservation of inorganic N compounds and minerals.
Biol. 86090

W. Va. Microbiology of Strip Mine Seepage Water in Relation to Plant Growth and Soil Conditions. To determine (1) microflora of seepage water and role of microorganisms in changes occurring; (2) effect of mine seepage water on soil it contacts; and (3) effect of this water on agricultural soils and plant growth in affected soils.
Plant Path., Agron. 13

REGIONAL PROJECTS

NC-16 Mineral Deficiencies in Soils. (1) To develop and improve methods for estimating and evaluating nutrient deficiencies in soils, and to coordinate their use among the states of the region; and (2) to evaluate the comparative efficiency of certain fertilizers and fertilizer application practices, and to investigate the causes of differences in efficiency under various crop, soil, and climatic conditions of the region.

Cooperating stations: This section, Ind. I-B: Section b: Ill. I-D, Iowa I-C, and I-D, Kans. I-D, Mich. I-D, Minn. I-D, Mo. I-B, Nebr. I-B, I I-C, and II-C, N. Dak. I-B, Ohio I-B, and Wis. I-B.

NC-17 Value of Organic Matter and Soil and Crop Management Practices in Improving Soil Structure and Productivity. (1) The evaluation of physical conditions of soil that are favorable to the yield of crops; and (2) the evaluation of the chemical composition and reactions of organic matter that affect structure and productivity.

Cooperating stations: This section, Ill. I-B and Ind. II-D: Section b: Nebr. II-C, and S. Dak. II-F: Section c: Iowa I-E, Kans. I-E, Mich. I-E, Minn. I-E, Ohio I-E, S. Dak. I-E, and Wis. I-E.

NC-19 Reduction of the Hazards in the Use of Pesticides. To isolate, define, and evaluate certain specific hazards associated with the use of insecticides, fungicides, herbicides and other pesticides to the end that such hazards may be minimized or eliminated.

Cooperating stations: This section, Ill. II-C, Mich. II-C, Mo. II-C, Ohio II-C, and Wis. II-C. See part 7, section 4, Insecticides, for Kans. project.

NE-11 Soil Structure Problems in Northeastern Agriculture. To (1) devise and evaluate practical means of identifying, creating and maintaining desirable physical conditions for crop production in Northeastern soils; and (2) to determine in what ways soil structure influences the growth and nutrition of plants.

Cooperating stations: This section, Del. II-D: Section b: N.H. II-B: Section c: Conn. (State) I-E, Conn. (Storrs) I-E, Conn. (State) III-B, Maine I-E, Md. I-E, N.H. I-E, N.J. I-E, N.Y. (Cornell) I-E, Pa. I-E. R.I. I-E, and W. Va. I-E.

NE-12 Influence of Environmental Factors on the Effectiveness of Herbicides. (1) To determine the influence of several climatic and soil factors on the effectiveness of representative chemicals from among the major groups of chemicals now used as selective herbicides; and (2) to determine physiological, chemical and other changes in plants induced by the use of these herbicides.

Cooperating stations: This section, Conn. (Storrs) II-C, N. J. II-C, N. Y. (Cornell) II-C, and W. Va. II-C. See part 24, Weed Control, for Del., Maine, Md., Mass., Pa., and R. I. projects.

Note: This regional project is scheduled for termination on June 30, 1958. The proposed title revision is Weed Life Cycles, Soil Microorganisms, and Light as Factors in the Control of Weeds in the Northeast.

S-14 The Influence of Chemical, Physical and Mineralogical Properties of Soils on Their Structure and on Plant Growth. (1) To devise means of separating the crystalline and amorphous components of selected representative southern soils; (2) identify and determine quantatively the various crystalline and amorphous components, including total organic matter; (3) to characterize these constituents through a determination of their chemical, physical and mineralogical properties; (4) to compare the reactions of these components in natural and in artificially prepared mixtures; and (5) to relate these soil properties to soil structure and to plant growth.

Cooperating stations: This section, Ark. I-C, Fla. I-C, Miss. I-C, Tenn. I-C and Texas I-C. Section b: Ky. I-E: Section c: Ga. III-B, La. III-A, N.C. III-B, Okla. III-B, P.R. I-E, Texas I-E and Va. III-B.

S-22 Pesticides Residues - Determinations, Sampling, Effects on Plants and Soils. To determine (1) standardization and application of chemical and/or biological methods of pesticides residue analysis; (2) standardization and application of field sampling procedures used in pesticide residue analysis; (3) evaluation of the effects of pesticide residues on plant growth, plant products and soil; and (4) determination of the pesticide residue load on agricultural commodities of economic interest to the South.

Cooperating stations: This section, Ark. II-C, Ga. II-C, La. II-C, and Texas II-C. For non-soil phases, see part 7, section 4, Insecticides.

S-35 Effects of Soil Microorganisms on Soil Properties and Plant Growth. The development of an understanding of the fundamental microbiological relationships in Southern soils pertaining to (1) the factors influencing decomposition of crop residues and the resultant effects upon soil properties and crop production; and (2) fixation and transformations of nitrogen.

Cooperating stations: This section, Ala. II-A, Miss. II-A, and Okla. II-A: This section, Ga. II-D, N. C. II-D, and S. C. II-D.

W-31 The Conservation and Improved Use of Nitrogen in Western Soils. (1) To evaluate the factors affecting nitrogen transformations in soils including losses, gains, immobilization, mineralization, and mineral fixation and to devise practices for the control of these transformations; and (2) to determine the effects of different nitrogen fertilizers on soil properties.

Cooperating stations: This section, Ariz. II-A, Calif. II-A, and Oreg. II-A: Section b: Colo. I-B, Hawaii I-B, New Mex. I-B, Utah I-B, Wash. I-B and Wyo. I-B