Review on the Soil Investigations in Japan during the last three Years, 1934-1936.†

By

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The soil investigations in the last three years in Japan are rather meagre in their quality and quantity which may be due to the loss of the pioneer workers like Professor DAIKUHARA, the retirement of some senior investigators from the active research work as Professors ASO and WAKIMIZU, Dr. IMASEKI and others, and also the number of active investigators being very few in comparison with other countries.

The review of the papers published in the said period indicates that they cover eleven branches of soil science, namely general, soil physics, soil chemistry, the colloidal chemistry of soils, soil biology, soil fertility, peaty soils, soils climate and vegetation, methods of investigation, classification of soils and regional soil science. Among them, soil chemistry, soil biology and regional soil science were investigated more than the rest.

The subject noted above will be treated separately.

I. General:

Only one paper is found in this field which was written by T. SEKI[1] who dealt with the significance of silica-sesquioxide ratios, the practical importance of acid treatment of soils, with a detailed discussion on "crystalline clay theory" and "absorption compound theory" and their applicability to the Japanese soils, as well as the importance of acid treatments.

II. Soil physics:

This subject has been very poorly developed in this country, and only a few investigators are engaged in this field.

The changes of oxidation-reduction potentials of water-logged soils were studied by K. SHIBUYA and his co-workers[2&3] who found that Eh of the water-

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logged soils is influenced by other factors than the change of P_H. The Eh of lateritic soils and sandstone-shale soils was determined under various conditions.

The adsorption of gases by soil was investigated by K. SHIBUYA and his collaborators[4] especially as to the rate and quantity of adsorption of ammonia gas and CO_2. They used 5 classes of soils and found that the rate of adsorption decreases with time, and the quantity increased with the humus content of the soil; more ammonia was adsorbed than CO_2 in all the cases. K. SHIBUYA and his co-worker[5] reported that the addition of humus modifies the physical and chemical properties of soils.

The photo-oxidation of ammonium compound in solution and soil was studied by S. OSUGI and his co-worker[6] who showed that nitrification in soil is not entirely due to bacterial action but at least in part is due to photo-oxidation which takes place in the presence of various organic photo-sensitizers under the influence of sunlight.

M. TOKUOKA[7] investigated the action exchange of clay and found it to take place on the surface of clayey particles.

III. Soil chemistry:

In this subject, the question of soil reaction has been investigated more than any others and a few reports are found on the special chemical analysis such as iodine contents.

In connections with soil reaction, the nature of the acidoid of clayey soil was studied by S. OSUGI and his co-worker[8] who applied PURI's tests to clayey soils lacking in organic matter and found that the specific reactions are due to a true acid, but it was questioned if the acidoid in all the soils is tribasic in nature as reported by PURI. OSUGI and others[9] reported on a peculiar behavior of some acid soils in regard to the change of acidity and Fe under fresh, air-dried and water-soaked treatments. Further they noted that the peculiarity of acid soils is marked in presence of abundant water. Other factors viz. temperature, micro-organisms and organic matter were investigated[10]. The application of organic manure increased the peculiarity markedly and there was a close relation with the quantity of Fe and P_H[11]; again they found that the acid soils of peculiar behavior contain some organic acids viz. formic, acetic and oxalic[12].

The correlation among the acidity, Mn and the crop of tea was studied by K. YAMADA[13]; the effect of reaction and lime content of soil on various crops were investigated by R. KAWASHIMA[14–17].

The iodine contents in one hundred and twelve soil samples were determined by A. ITANO and his co-worker[18], and also the influence of seawater, elevation, surface and subsoils, and fertilizers applied on the iodine contents was investigated[19]; M. MIYOSHI[20] investigated the salt-soluble phosphoric acid in volcanic ash soils and found it vary by the nature of soils.

T. WAKIMIZU[21] collected the iron-concretion in Manchuria and analysed for eleven components among which Fe_2O_5 38.92; Al_2O_3 5.72 % were found.

IV. The colloid chemistry of soils:

Investigations on the colloidal chemistry of soils are carried out by only a few investigators in Japan.

K. KAWAMURA and his co-worker[22] studied the soil colloids of alluvial rice-field soil and volcanic soils; determined the P_2O_5 content of the colloids[23]; analysed the soil colloids of various geological and petrographical origin[24]; further made the Röntgen analysis of the colloids found in the soils studied previously[25]. S. OSUGI and his co-worker[26] separated and analysed the inorganic colloids of 0.1 μ on the average from clay samples; K. SHIBUYA and his co-worker[27] studied the nature of colloidal clays as revealed by the equilibrium velocity of ionic exchange.

V. Soil biology:

The soil biological investigations carried on in Japan may be summarized in the following groups: a) general, b) nodule bacteria, c) Azotobacter, d) Actinomycetes, e) Algae.

M. ADACHI and his co-worker[28] isolated many strains of the heterotropic bacteria from the soils in Formosa.

A. ITANO and his co-worker studied the root nodule bacteria of *Astragulus sinicus* quite intensively in many phases of their physiology: the rate of migration of the bacteria in the soils as influenced by the moisture content of the soils; the chemotaxic action toward the seeds, especially to the germinating seeds[29]; the influence of C : N ratio[30]; of plant extracts[31]; of different parts of plant[32]; of the extract of nodules[33]; of the titanium salts[34]; on the electrical properties of the accessary substance[35]; the influence of various alkaloids[36]. K. KONISHI and his co-workers studied on the respiration of nodule bacteria[37 & 38] and also their symbiotic study with certain Actinomycetes[39].

The physiological investigation of Azotobacter was undertaken by A. ITANO and his co-worker[40–42] concerning the influence of monochromatic and ultraviolet rays; on the electrophoretic character[43]. KONISHI and his co-worker[44] reported on the influence of inorganic constituents in soil extract on the growth of Azotobacter.

The chemical composition of some algae in the paddy field was studied by M. SHIOIRI and his co-worker[45].

VI. Soil fertility:

The general tests on the soil fertility are carried on at each experiment station throughout the country but only few reports of the research work are found. T. IWATA and his co-worker[46] studied the mineralization of nitrogen of poultry excrement in soils.

VII. Peaty soil:

The investigation on the humic acid, hymatomelanic acid and peat by means of polarograph with mercury cathode electrode was undertaken by M. TOKUOKA[47] and a new method of quantitative determination is proposed ; the analyses of five strata which were found in the profile of the peaty soil were made H. OKAMOTO[48].

VIII. Soil, climate and vegetation:

The weathering of volcanic rock was investigated by M. HARADA[49] who reported in detail on the weathering of basalts under the annual temperature of 14.8°C. and 1618.8 mm. annual rainfall, the determination of limonite and hamatite by photochemical method and the chemical composition of weathering products of basalt[50].

R. KAWASHIMA[51] investigated the exchangeable cation content as related to the climatic soil types in Manchuria.

IX. Methods of investigation:

A method for collecting the soil samples to be studied in the laboratory under as natural conditions as possible, is proposed by A. ITANO[52]. This consists of taking a soil monolith of a small size, 15×15×20 cm. by means of a brass case which is made up of the separate sides and bottom so that each plate can be inserted into the soil without disturbing the soil conditions to any extent ; by using the said method in combination with a temperature recording device, the influence of temperature on the microorganisms was studied by ITANO and his co-worker[53] ; VERWELL's method for direct p_H determination is modified and used in combination with ITANO's portable potentiometer in the paddy-field soil and compared with those results obtained by the previously known methods[54 & 55].

S. OSUGI and his co-worker[56] reported on a micro-analytical method of TEORELL's method applied to the soil extract ; the same authors[57] used WINTER's method and determined the water soluble alumina in the tea garden soil.

X. Classification of soils:

T. SEKI[58] proposed a new plan for the classification of volcanic soils into 1. siallitic, 2. subsiallitic, 3. acid sub-allitic, 4. sub-allitic and 5. allitic groups with reference to the silica alumina ratio, dyestuff ratio and soil reactions.

XI. Regional soil science:

The investigations which may be placed under this heading are concerned with : a) the special kinds of soils in Japan and Manchuria ; b) classification of soils in certain districts in Japan ; c) the origin and formation of soils in certain parts in Japan.

SEKI[59] studied the brown earths in Japan and compared them with those found in Europa and America, and emphasized the importance of further study of the subtype of the brown earths; K. HOSODA[60] studied the physico-chemical properties of the black soils to find the causes of unproductiveness and proposed a method of improvement; the characteristics of Formosan clay were compared with those in Europe by M. TOKUOKA[61]; M. HARADA[62] studied the distribution and mineralogical classification of the decomposed pumice in the north-western part of Kwanto District in Japan.

T. IRIKAWA[63] investigated the classes of soils from the tobacco producing district; M. KAMOSHITA[64] classified the soils on the plain of Tsugaru into 7 soil types after STREMME's designation.

M. HARADA[65] studied the origin of brown soils in Kwanto plain; K. TSUKUNAGA and his co-worker[66] reported on the formation and properties of terra rossa in Manchuria and compared with that in Mediterranean region; R. KAWASHIMA[67] studied the soil formation of allitic nature on the Pacific coast of south-western part of Japan; in northern Kyushu[68–71]. K. MIYAKE and his co-worker[72] investigated soil formation in northern Japan-climatic soil types. H. MISU[73] studied the soils in Korea as to their chemical properties and further proposed a mathematical expression of the buffer action of soil.

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