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ABSTRACT

Heba Yahya Ahmed Saad: Studies of Silicon Behavior in both Soil and Plant Including the Interactions with Phosphorus. Unpublished Ph.D., Thesis, Soils Dept., Fac. Agric., Ain Shams Univ., 2018.

Multi-series incubation experiments followed by short term adsorption experiments and pot experiments were conducted to study the behavior of silicon (Si) and its interactions with phosphorus (P) in a clay soil.

The results declared that the availability of Si increased by increasing of the added amount up to 50mg Si Kg^{-1}, and decreased afterwards. Also, the availability of P increased by increasing the added amount of Si to soil.

Responses of adsorption rate of Si to certain environmental conditions were studied, such conditions being the applied ion concentration in the concerned solution, equilibrium concentration and interaction with P, by applying Freundlich as well as Langmuir isotherm. However, Freundlich isotherm gave good fit with the data than Langmuir isotherm. Hence, investigations were performed through evaluating the responses of ion adsorption to ion concentration in the concerned solution, these studies being carried out through evaluation of both adsorptive capacity (K_f) and the intensity of adsorption or sorption energy constant of Freundlich isotherm model (1/ n). Results showed that the amount of adsorbed Si onto soil increased with increasing either the applied or equilibrated Si concentration in all incubated soil samples. Also, silicon adsorption onto soil decreased in the soil which incubated with high than with low Si concentration. As well as, application of P to the soil decreased the amount of adsorbed Si on all incubated soil samples.

The responses of growth, element status at booting growth stage of wheat plant to the applied Si and P together with their interactions were

followed. Obtained results showed that silicon and phosphorus were favorable, for plant growth, it increased with increasing Si or P concentration. Increasing the applied Si or P concentration to soil increased the fresh and dry weights of wheat plants at booting growth stage. In general, positive significant responses to the applied Si or P concentrations to soil were found in the status of Si or P in the grown wheat plants. Moreover, the interaction between Si and P applications at booting growth stage of wheat plants generally increased the growth parameters. Such responses were significant for fresh weight and dry weight.

Key words: Silicon, Phosphorus, Incubation, Adsorption, Freundlich isotherm, Wheat, Plant growth.