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Impacts of Different Vegetation Types on Soil Properties in Hubei, China

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ABSTRACT

Studies on impact of vegetation types on soil Physico-chemical properties in two different types of farming fields in Hubei Providence, China were carried out in this study. Thirty soil samples were collected to represent tomato soybean and filed with no agricultural practices. Both top soil and subsoil samples were collected to further correlate the nutrient transport mechanisms and dynamics due to the vegetation types. We found that tomato field sites have strong dependence on the nitrate, ammonium, and phosphorous concentrations for top soils. There was no strong dependence of the soil nutrients examined in the soybean field sites. Results from our study suggest that not only the fertilizer types or application can impact the soil nutrient concentrations and dynamics but also the vegetation types on the top soils have strong impact onthe soil chemical properties.

Key words: *Plagiocephaly; Orthotic devices; Nonsynostotic plagiocephaly*

Introduction

Understanding the physiological and chemical changes of the soils due to farming practices is essential for planning future plant breeding strategies and managing the natural resources. Fertilizer application rates in intensive agricultural systems have increased dramatically in recent years on the North and Central China Plain, especially in vegetable production systems. Currently, farmers use very large amounts of fertilizers and irrigation water to obtain maximum yields because of the high economic value of the extra yields and the lack of stringent regulations due to the difficulties in the accurate management of water and nutrient supply in these areas. For example, recent field study indicated that the nitrogen containing fertilizer is often applied at rates greater than the soil's natural capacity leading to changes in soil water balance. This, in combination with a lack of leaching by rainfall and strong evaporation of soil water with high fertilizer application rates, may lead to increasing salinity in the surface soils in which vegetables are grown [1].

The main anion present in such depleted soils is mostly nitrate (NO_3) and its concentration is positively correlated with total soil salinity. Nitrogen is one of the most critical plant nutrients for plant yield productivity but is often deficient in the soil. Therefore, nitrogen containing fertilizers or organic soil amendments such as compost or manureare applied to supplement the soil in excessive amount. However, agricultural runoff containing excessive nitrogen leachate can contaminate both surface and groundwater and ultimately cause eutrophication. Therefore, it is important to incorporate enough nitrogen into the soil to maximize crop yield, while avoiding superfluous amounts that can lead to harmful environmental consequences. Increased NO_3-leading to exacerbated soil salinization furtherincreases the osmotic potential of the soil solution and pH condition changes, resulting in the water stress and ion antagonism in the crops. Soil pH declined to 4.3 from 5.6 in some cases, suggesting potential detrimental long-term effects on crop yield and quality in these systems after 13 years of vegetable agricultural practice without monitoring nitrogen containing fertilizer applications in their filed sites located in in Shouguang, Shandong province. Therefore, balancing the amount of nitrogen needed for optimum plant and crop growth while minimizing the NO3 that can be potentially transported to ground and surface waters remains a major challenge especially for countries with exponential increase in agricultural demands [2].

Phosphorus is another essential element for plant growth. Together with nitrogen, both elements are required for energy transfer reactions to sustain plant life as well as living organisms in the soil environment. Phosphorus is used

extremely important because their increased concentrations in soil can lead to environmental issues if mismanaged. Other studies demonstrated that geographical properties of the area also have significant influence on crop yield. Topography has an extensive impact on crop yield. They observed a direct positive correlation on soil properties and yield variability. Others also demonstrated landscape positions and soil physical properties could also be an important yield-affecting factor. GIS enhanced approaches to identify yield factors and soil organic matters on alarge scale have been developed to further create quantitative relationships between soil physical properties and the yield potentials of the land at a large scale. For example, demonstrated soil moisture, texture, and nutrient are highly correlated with the structure and pattern of vegetation based on their field and laboratory data analysis [3].

Systematic studies on the impacts of different cropping systems (i.e., different management practices) and fertilizer application rates as well as a quantitative analysis on effects of different geographical conditions on soil properties are needed for the proper development of sustainable high yielding vegetable systems in relation to environmental quality. The objectives of the present study were to investigate the variations of soil nutrients and the changes in soil pH in different types of vegetable cropping fields. Two different types of farm fields that grow either tomato or soybean were selected in Gongan city located in Hubei Providence in Central China. Soybeans are considered to be more competitive crops compared to tomatoes in terms of nutrient requirements. For example, sandy loam soil areas in which soybeans and tomatoes have been grown in rotation for more than 10 years have better retention of the soil nutrients and exhibit better balanced Physico-chemical properties compared to the fields that have grown only soybeans. Results from our study will quantify the impacts of the vegetable types and the subsequent land management plans on the Physico-chemical properties of the examined farming soils in China to better suggest sustainable farming practices in the future [4].

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