

How Important are Phosphorus and Potassium for Soybean Production in the Cerrado of Brazil?

By Eros A.B. Francisco

Brazil appears poised to overtake the U.S. at the world's largest soybean producer. The successful establishment of a sustained, high-yielding environment within Brazil's highly productive, but nutrient poor, cerrado soils is at the heart of this new claim to fame.



Visual symptoms of K deficiency in soybean. Plants have green stems with yellow/brown discoloration and scorching along outer margins of older leaves.

The Cerrado is a vast tropical savanna eco-region of Brazil, covering 200 M ha in seven states, with a typical climate of two seasons per year, wet and dry, and a variety of weathered soils. Besides its relevance for biodiversity with hundreds of different species of fauna and flora, the Cerrado is also known for its vigorous agriculture development causing praiseful comments that refer to the area as the “world’s barn”. But, in order to build such agriculture in this region, extensive field research was conducted to identify the soil limitations and P and K were found to be the most limiting nutrients for profitable crop production, especially soybeans.

Common abbreviations and notes: N = nitrogen; P = phosphorus; K = potassium.

The poor fertility of Cerrado soils is well known with high acidity and low P and K levels being very common. Therefore, the first ameliorations required to achieve good yields are lime and P and K fertilizers. Phosphorus and K are crucial for prolonged soybean grain production in the Cerrado. One essential function of P is in energy storage and transfer where ADP and ATP (adenosine di- and triphosphates) act as energy currency within plants. This is very important for soybeans not only for plant growth, but also for promoting biological N fixation. The short supply of P may decrease nitrogenase activity and ATP concentration in the nodules impacting the ability of the plant to meet its N need. In regard to K, despite the fact that it is not associated with any compounds and functions solely as K^+ in the plant, it is related to several important functions




Visual symptoms of P deficiency in soybean. Plant growth is stunted and can have dark green coloration with necrotic spots. The deficiency ultimately delays blooming and maturity.



Dramatic contrast between two soybean fields where the only difference was the lack of application of P and K in the first year of production in a typical clay Cerrado soil in Mato Grosso State, in the Midwest region of Brazil.

such as enzyme activation, water and energy use relationships, translocation of assimilates, and protein synthesis. So, a short K supply causes a large number of problems in the plant.

Visual deficiency symptoms of P and K in soybeans are easy to identify. As both nutrients are mobile within the plant, when a deficiency occurs they are translocated from older tissues to the active meristematic regions, therefore, symptoms will generally appear in old leaves and move to younger leaves if the deficiency persists. For K, (i) irregular yellow mottling around leaflet margins during early growth stages, (ii) reddening, yellowing and dying of leaf margins on older leaves, and (iii) a ragged appearance of older leaves is typical. For P, the main symptoms are (i) slow growth, small leaflets and stunted, spindly plants, and (ii) dark green to bluish-green leaves. Conditions often associated with P and K deficiency include: low PK soil test, low soil organic matter content, sandy soils, and large P removal by previous crops.

Sound P and K management is an essential component of successful soybean production in the Cerrado. 

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New Publication on Specialty Coffee: Managing Quality

This publication developed out of a scarcity of published information on how to produce fine, high quality coffee that creates an excellent cup. The more the authors searched for information on coffee quality, the more they realized that a superb cup of coffee depends on a complex of processes along the supply chain that allows little margin for error at any stage. Furthermore, as so often occurs when personal preferences and tastes are involved in defining quality, the process of producing magnificent coffees is as much an art as a science.

Consequently, as the book evolved, the authors tried to combine hard science with art and put it into a business context ...the result is a book with a wide range of styles.

“The authors have drawn on their long personal experience in quality coffee and their extensive network to create a resource book that covers the basic concepts of a quality market, how to manage crops for better tastes (genetics, agronomic practices, processing practices), how to structure value chains to improve relationships and incentives for quality management, and how to begin to address some of the upcoming challenges to quality coffee such as climate change.”

-Don Seville, Co-Director of The Sustainable Food Lab

“The book has a solid scientific focus but will appeal to a broad readership. It is a compilation of 15 Chapters, each written by an eminent lead author and edited by an equally eminent team.”

-Anthony Marsh, Coffee Consultant

“A few critical notes notwithstanding, this book is highly recommended to all stakeholders in the coffee industry as an authoritative and comprehensive source of information on several aspects of the product life cycle of coffee, the specialty

arabica coffees from Meso America for the USA market in particular.” -Herbert A. M. van der Vossen, Plant breeding and Seed Consultant, Board Member of the Association for Science and Information in Coffee

This book is neither a blueprint nor a recipe for specialty coffee production. The intention is to provide information and ideas that stimulate and support creative thinking that can provide the basis for developing and adjusting the myriad processes and details of the specialty coffee supply chains that produce a multitude of coffees with distinctive traits from a diverse range of origins.

You can order your copy of this book for USD 100.00 through IPNI's on-line store at: <http://info.ipni.net/COFFEE-MANAGING-QUALITY>.

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