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Popular Article

Potassium Management in Indian Agriculture: Current Status, Challenges, and Strategic Solutions Subhransu Sekhar Mohapatra^{*}, Satyait Marndi

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Abstract Multiuscip/i

This article examines the current status of potassium (K) in Indian soils, highlighting its crucial role in plant growth and productivity. It explores the factors affecting K consumption, including government policies, fertilizer imbalances, and regional disparities. The article emphasizes the importance of balanced fertilization, better K application awareness, and government initiatives to enhance K use in agriculture. The depletion of K due to misapplication is also discussed, along with remedies to sustain soil fertility.

Keywords: Potassium (K), soil fertility, fertilizer misapplication, NPK ratio, agricultural productivity

Introduction

Potassium is a crucial macronutrient for plant growth in Indian agriculture. However, effective potassium management remains a challenge due to soil variability, climate change impacts, and limited understanding of optimal application rates. Recent studies suggest exploring alternative potassium sources and optimizing application timing/placement. Integrated strategies combining chemical

fertilizers with organic amendments can improve crop yields and nutrient use efficiency. To address these challenges, a holistic approach characteristics, considering soil crop requirements, and climatic conditions is necessary. Implementing Cevidence-based practices can optimize productivity while minimizing environmental impacts associated with excessive potassium applications.



Potassium status of soils in India. Hasan, R. (2002).

Status of Potassium in India

In 1969, it was reported that K availability was low in 20% of districts, medium in 52%, and



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high in 28% (Ramamurthy and Bajaj, 1969). Later, soil test results from 4.5 million samples indicated that 20% of districts (63) were low, 42% (130) medium, and 38% (117) high in available K (Ghosh and Hasan, 1976). Gujarat, Haryana, Madhya Pradesh, and Rajasthan were rated high in K, while Andhra Pradesh, Bihar, Kerala, and Tamil Nadu had the most medium-K areas. Assam, Jammu & Kashmir, and Uttar Pradesh showed significant low-K areas. Despite negligible K fertilizer use, over 40 districts shifted to high K status. Soil tests from 1997-1999 showed low K in Tripura and Jammu & Kashmir, medium in Assam, Punjab, and Uttar Pradesh, and high in Andhra Pradesh, Gujarat, and Tamil Nadu (Motsari, 2002; Hasan and Tiwari, 2002). The general trend indicated a decline in K levels from medium-high in 1976 to medium-low by 2002 (Naidu et al., 2010; Naidu et al., 2011).

Function of K in Plants

Potassium is essential for plant growth and metabolism, activating enzymes in photosynthesis respiration while and maintaining turgor pressure for cell structure. It regulates stomatal function, balancing gas exchange and water loss, and ensures proper ion balance with calcium and magnesium. Potassium aids in water uptake, nutrient transport, protein synthesis, and chloroplast function, all critical for plant development and health. Additionally, it strengthens plant immunity, enhancing resistance to diseases and pests. Potassium also improves fruit quality, influencing size, color, taste, and nutritional

value by regulating sugar content and other components, making it crucial for both plant productivity and food quality.

Deficiency Symptoms

healthy plant tissue, potassium (K) In concentrations typically range from 1-5%. Identifying deficiency symptoms of K is often simpler compared to phosphorus deficiency. This is because K is mobile within the plant tissue, so symptoms of deficiency first appear on older leaves. Potassium deficiency in agriculture and horticulture leads to several issues, including chlorosis (yellowing) and necrosis (browning) along leaf margins, stunted growth, and poor root development, which make plants more drought-prone. Crops like cereals may experience lodging due to weak stems, while fruits like tomatoes, apples, and citrus suffer from reduced size, uneven ripening, poor taste, and short shelf life. Deficiency also increases susceptibility to diseases in crops like potatoes and bananas, causes tip burn in leafy vegetables, and delays maturity in crops like corn and cotton. Additionally, it reduces yield and seed quality in grains, emphasizing the need for potassium fertilization.

Depletion of K due to fertilizer misapplication

Fertilizer misapplication, defined as excess or insufficient nutrient application, has contributed to potassium (K) depletion in Indian soils. K fertilizer use remains low compared to nitrogen (N) and phosphorus (P), with N consumption rising from 1.4 to 85



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kg/ha, while K increased from 0.2 to 18 kg/ha between 1960 and 2010 (**Table 1**). In major food-producing states like Punjab, Haryana, and Uttar Pradesh, K application remains below 10 kg/ha. The imbalance is due to government pricing policies, with N and P fertilizers being cheaper and more accessible, and farmers' lack of awareness regarding K's importance. Additionally, some soils show little response to K, despite its low status, while others with high K status respond well to K applications. **Table.1** Fertilizer consumption in India

	Fertilizer consumption Fertilizer consumption						Ratio of N <mark>: P: K</mark>
	(000 t)			(kg/ ha)			
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
1960-61	210	53	29	1.39	0.35	0.19	7.3:1.8: 1.0
1970-71	1487	462	228	8.92	3.26	1.43	6.3:2.2: 1.0
1980-81	3678	1214	624	21.3	7.00	3.60	5.9:1.9: 1.0
1990-91	7997	3222	1360	43.1	17.3	7.20	6.0:2.4: 1.0
2000-01	10920	4215	1567	58.9	22.8	8.50	7.0:2.7: 1.0
2010 -11	16558	8050	3514	84.9	41.3	18.00	4.7:2.3: 1.0
2015-16	17372	6979	2401	89.1	35.8	12.3	7.5:3.0: 1.0
2015-16 [Sourc	17372 ce: I	⁶⁹⁷⁹ Depar	tmer	^{89.1}	^{35.8} of A	12.3 gricu	7.5:3.0: 1.0 Iture a

Factors Influencing Potash Consumption in India and Strategic Solutions for Improved K Management

In India, potash consumption is influenced by government-set retail prices, potash availability from imports, and regional potash carrying complexes. While complex fertilizers gained popularity in southern India in the 1970s, their use in northern regions remains limited due to inadequate potash supply and a lack of distribution infrastructure. Although urea availability has been satisfactory, other fertilizers, including potash, face shortages. The stagnant production of complex fertilizers in the past decade has exacerbated the imbalance in NPK ratios. Farmers often neglect potash application due to limited awareness, as its benefits are not immediately visible, unlike nitrogen and phosphorus.

To combat K depletion, management practices should focus on balanced fertilization, including soil testing to ensure proper nutrient application. Educating farmers on the importance of K for long-term crop health is vital. Government initiatives, such as subsidies for potash fertilizers, promoting awareness programs, and expanding the production and distribution of complex fertilizers, are crucial to improving potash and maintaining use sustainable agricultural productivity. Additionally, expanding potash production and ensuring capacities availability in underserved regions can help correct the existing imbalance in nutrient application.

Conclusion:

To address potassium depletion in Indian soils, there is a need for a balanced approach to fertilization, increased awareness among farmers, and more government support. Expanding potassium fertilizer production and improving its accessibility will help maintain soil health and enhance agricultural productivity in India.



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