Bioscience Methods 2026, Vol.17, No.1, 43-56
http://bioscipublisher.com/index.php/bm

Research Insight **Open Access**

The Effects of Different Potassium Fertilizer Application Rates on Sweet Potato Yield, Dry Matter Content and Sugar Accumulation

Yanhong Zhong[1,2]
1 Kaihua Wohua Family Farm, Kaihua, 324304, Zhejiang, China
2 Zhejiang Agronomist College, Hangzhou, 310021, Zhejiang, China
Corresponding author: 407292539@qq.com

Bioscience Methods, 2026, Vol.17, No.1 doi: 10.5376/bm.2026.17.0005
Received: 09 Jan., 2026
Accepted: 10 Feb., 2026
Published: 22 Feb., 2026

Preferred citation for this article:
Zhong Y.H., 2026, The effects of different potassium fertilizer application rates on sweet potato yield, dry matter content and sugar accumulation, Bioscience Methods, 17(1): 43-56 (doi: 10.5376/bm.2026.17.0005)

Abstract Sweet potatoes are a typical potassium-loving crop. Achieving a simultaneous increase in both high yield and high quality is of great significance for the sweet potato industry. However, the current production practice, which focuses on yield while neglecting quality, leads to limited improvement in the stability of yield and the quality of sweet potato tubers. This study focuses on the regulation of potassium fertilizer dosage to achieve a coordinated improvement in yield and quality of sweet potatoes. By setting different potassium fertilizer gradients (with consistent nitrogen and phosphorus supply and staged potassium application), the yield, dry matter rate, sugar components, and related physiological indicators were systematically observed. A multi-objective comprehensive evaluation was used to select the optimal potassium application strategy. The results show that an appropriate amount of potassium fertilizer can significantly increase the yield and commercial rate of sweet potato tubers, promote the accumulation of dry matter and starch, and increase the sucrose content of tubers, thereby achieving a balance between yield and quality. Insufficient potassium application limits yield due to insufficient nutrient supply and the poor flavor of tubers; excessive potassium application leads to a slower increase in yield and a decrease in fertilizer utilization rate. Mechanism analysis reveals that potassium enhances photosynthesis and the distribution of assimilates to the tubers, accelerating starch synthesis and sugar accumulation to simultaneously improve yield and quality. Based on the evaluation of all indicators, this study determined the appropriate range of potassium application for high-yield and high-quality sweet potatoes and proposed a fertilization strategy of "staged potassium application + goal-oriented", which can provide guidance for sweet potato production.

Keywords Sweet potato; Potassium fertilizer application; Dry matter ratio; Sugar composition; Yield and quality

1 Introduction

Sweet potatoes are an important food and industrial raw material crop in China, widely cultivated due to their wide adaptability and tolerance to poor soil conditions (Etana et al., 2019). With the upgrading of residents' consumption and the development of the processing industry, the market has put forward the requirement of both high yield and high quality for sweet potatoes (Sharmin et al., 2024). Achieving the coordinated improvement of sweet potato yield and quality is not only related to farmers' income increase and industrial competitiveness, but also to food processing and health consumption demands. However, there is currently a problem of unbalanced fertilization in production: farmers often focus on nitrogen fertilizer input while neglecting potassium fertilizer supplementation, resulting in insufficient potassium supply in the soil, which becomes a key factor limiting the stable yield and quality improvement of sweet potatoes (Walter et al., 2011). Therefore, it is urgent to clarify the mechanism of potassium fertilizer management on the yield and quality of sweet potatoes, and to formulate fertilization strategies that balance high yield and high quality to meet the needs of the sustainable development of the sweet potato industry (Aboyeji et al., 2019).

Potassium is one of the key nutrient elements required for the growth and development of sweet potatoes (Lv et al., 2021). Throughout the entire growth period, sweet potatoes have a higher demand for potassium than for nitrogen and phosphorus. Especially during the period of tuber enlargement, a large amount of potassium supply is needed. An appropriate level of potassium nutrition is an important guarantee for achieving high yields (Geng et al., 2024). Potassium acts as an activator for various enzymes in sweet potatoes, which can enhance the intensity of photosynthesis in leaves and the transport capacity of assimilates, and strengthen the plant's resistance and storage tolerance (Shu et al., 2024). As a "lubricant" for carbohydrate transportation, potassium can regulate the source-sink relationship between the aboveground and underground parts of sweet potatoes, promoting the transport and distribution of photosynthetic products to the tubers (Gao et al., 2021). Adequate supply of potassium fertilizer can optimize the root-shoot ratio of sweet potatoes, enhance tuber enlargement and dry matter accumulation. Thus, potassium nutrition plays a crucial role in the formation of sweet potato tubers and the distribution of assimilates, and is a necessary condition for simultaneously improving the yield and quality of sweet potatoes.

This study aims to clarify the influence patterns and physiological mechanisms of different potassium fertilizer application rates on the yield and quality of sweet potatoes, and to meet the practical needs for the simultaneous improvement of yield and quality. The core scientific questions include how does the potassium fertilizer application rate affect the yield and its constituent elements of sweet potatoes, as well as the trend of changes in the commodity rate of the tubers; The mechanism of the effect of potassium supply level on the dry matter rate of sweet potato tubers and starch accumulation; What are the effects of potassium fertilizer application rates on the sugar content and composition of sweet potato tubers, and the biochemical regulatory pathways; How to determine the optimal potassium application range for sweet potatoes based on the comprehensive evaluation of yield and quality indicators. Regarding these issues, the innovation points of this study lie in: through setting up a systematic potassium fertilizer gradient experiment, combined with multi-index observation and multi-objective evaluation methods, to comprehensively assess the impact of potassium application on the "high yield and high quality" goal of sweet potatoes, and to propose an optimized fertilization mode of "periodic potassium application and demand-based potassium supply", in order to provide new ideas and theoretical basis for scientific fertilization of sweet potatoes.

2 Theoretical Framework and Research Progress

2.1 The physiological basis of potassium regulation of the "source-sink" relationship and root formation

Potassium regulates the "source-sink" relationship in sweet potatoes through various physiological pathways, thereby influencing the formation and expansion of the roots (Jiang et al., 2024). As the source (leaf) end, potassium helps maintain a high photosynthetic efficiency and assimilate synthesis rate. When potassium is sufficient, the regulation of stomatal opening and enzymatic reactions in the leaves becomes more efficient, avoiding feedback inhibition caused by excessive accumulation of photosynthetic products within the leaves, which is conducive to the continuous supply of transportable forms of carbohydrates (Shu et al., 2024). During the transportation process, potassium enhances the loading and unloading capacity of the phloem: on the one hand, potassium promotes the development of conducting tissues in the stem (such as increasing the cross-sectional area of the stem) and the formation of osmotic potential gradients, enhancing the driving force for the transport of photosynthetic products from the source to the sink; on the other hand, potassium ions themselves are important participants in assimilate transport, and their concentration gradients help maintain the efficient transport of sugars and other assimilates (Duan et al., 2018). For the sink (root) end, potassium nutrition can enhance the competitiveness and strength of the root, promoting earlier tuber differentiation and faster expansion. After potassium application, the sweet potato roots can promptly unload and store the photosynthetic products from the source end, reducing waste caused by accumulation at the source end (Gao et al., 2021). In summary, potassium enhances photosynthesis, expands assimilate transport channels, and increases the strength of the root storage, achieving the optimized regulation of the sweet potato's source-sink relationship and laying the physiological foundation for high-yield root formation.

2.2 Research conclusions, differences, and causes regarding potassium fertilizer application and yield/dry matter ratio

A large number of studies have shown that applying potassium fertilizer has a significant effect on increasing the yield of sweet potatoes (Singh et al., 2017; Geng et al., 2024). However, there are certain differences in the conclusions regarding the extent of yield increase and the dry matter content of the tubers. The consistent finding is that compared to not applying potassium, applying potassium in a reasonable amount can significantly increase the yield of sweet potato tubers. Potassium fertilizer promotes the allocation of photosynthetic products to the tubers, increases dry matter production and tuber biomass, thereby achieving yield increase (Gao et al., 2021). However, different experiments report inconsistent changes in the dry matter ratio of the tubers (i.e., the ratio of dry weight to fresh weight): some studies indicate that potassium fertilizer can increase the accumulation of starch and dry matter in the tubers, leading to an increase in the dry matter ratio of sweet potatoes (Gao et al., 2021); while other experiments observed that high amounts of potassium fertilizer (especially potassium chloride) instead reduced the dry matter ratio of the tubers and increased the moisture content of the tubers (Huang et al., 2025). This difference is partly attributed to the influence of the type of potassium fertilizer - chloride ions may inhibit starch accumulation, resulting in a decrease in the dry matter content of the potato tubers treated with KCl, while potassium sulfate (K_2SO_4) and other sulfate potassium sources have the effect of increasing dry matter content (Huang et al., 2025). Additionally, the optimal amount of potassium fertilizer varies depending on environmental conditions and varieties: in poor soil conditions in tropical regions, applying potassium at approximately 80 kg K_2O/ha can achieve the best effect of increasing yield and improving quality (Singh et al., 2017); while in high-yield cultivation conditions, sweet potatoes may require a higher potassium application level (such as 150~300 kg K_2O/ha) to fully exert their yield-enhancing potential (Geng et al., 2024). The reasons for these differences include soil potassium supply capacity, climate and water conditions, the characteristics of sweet potato varieties, and the nitrogen and phosphorus levels of the base fertilizer, among other factors. In summary, potassium fertilizer application should be adjusted according to specific production conditions, ensuring yield increase while also taking into account quality indicators such as the dry matter ratio of the tubers, to achieve a coordinated and unified balance between yield and quality.

2.3 Mechanism pathway of potassium's impact on sugar accumulation and sugar component composition

The application of potassium fertilizer not only affects the yield and starch accumulation of sweet potatoes, but also alters the sugar accumulation and sugar component composition of the tubers by regulating the carbohydrate metabolism pathway (Gao et al., 2021). Generally speaking, adequate potassium supply helps increase the total soluble sugar content in sweet potato tubers and optimize the sugar composition ratio (Shu et al., 2024). Mechanistically, potassium levels can influence the balance of "starch-sugar" conversion: when potassium is insufficient, the carbohydrate metabolism of the plant is hindered, often resulting in abnormal accumulation of soluble sugars (such as sucrose, glucose, etc.) in the tissues while the starch synthesis is limited (Sheng et al., 2023); moderate potassium application promotes the conversion of sucrose to starch, increasing the starch concentration, and avoiding excessive sugar accumulation (Gao et al., 2021). This process involves the regulatory role of multiple key enzymes. Potassium is an activator of enzymes related to sucrose metabolism and starch synthesis. Adequate potassium supply can enhance the activity of sucrose synthase, starch synthase, and other enzymes, promoting sucrose decomposition and starch polymerization (Gao et al., 2021). In addition, potassium's influence on carbohydrate transport enzymes, conversion enzymes, etc., helps maintain the sugar concentration gradient between the source and sink, thereby regulating the distribution of sugar in various parts of the plant (Jiang et al., 2024).

3 Experimental Design and Index System

3.1 Overall design concept of potassium fertilizer gradient and uniform nutrient background

This study adopts a field control experiment design, setting gradients with different potassium fertilizer application rates to explore the impact of potassium levels on sweet potato yield and quality (Geng et al., 2024). A suitable sweet potato variety (such as the fresh-keeping type variety 'Shangcui 19' or the high-starch type variety) was selected, and several potassium application levels were set on the same field (for example, no potassium application as a control, and low, medium, slightly high, and excessive potassium fertilizer treatments), forming a gradient comparison (Lv et al., 2021). The nitrogen and phosphorus nutrient inputs for all treatments remained consistent to ensure that potassium was the only variable, eliminating interference from other nutrient differences (Shu et al., 2024). To closely reflect the potassium demand characteristics of sweet potatoes in production, potassium fertilizer was applied in a phased manner: a portion of base fertilizer potassium was applied at planting, and the remaining potassium fertilizer was applied during the sweet potato covering period or the tuber expansion period to ensure adequate soil potassium supply in the middle and later stages (Gao et al., 2021). This design concept can simulate the actual production management conditions (appropriate nitrogen and phosphorus supply, phased potassium supply) and systematically examine the impact of potassium fertilizer application levels on sweet potato growth, physiology, and yield and quality.

3.2 Observation indicators and evaluation dimensions: yield, dry matter rate, sugar components and related physiological indicators

To comprehensively assess the effect of potassium fertilizer application, this study monitored multiple indicators under each treatment (Geng et al., 2024). In terms of yield, the total fresh potato yield and the rate of commercial potatoes (the proportion of tubers meeting commercial specifications) were measured, and the yield composition (number of tubers per plant, tuber weight per plant, and distribution of tuber size) was analyzed (Singh et al., 2017). In terms of quality, the dry matter rate of tubers (dry weight of tubers / fresh weight), starch content, and sugar components (mainly including reducing sugar and sucrose content) were determined (Gao et al., 2021). Reducing sugar and sucrose respectively represent the sweet substances and total sugar reserves of potatoes, which have different meanings for flavor and processing quality. In terms of physiological indicators, the physiological parameters related to yield and quality formation of the plants were monitored, such as chlorophyll content in functional leaves (SPAD value), net photosynthetic rate, potassium content in leaves and tubers, to evaluate the effect of potassium on photosynthetic source strength and nutrient absorption (Shu et al., 2024). In addition, the activities of key enzymes such as sucrose synthase and amylase in tubers were determined to help explain the physiological mechanism of potassium regulating carbohydrate allocation (Gao et al., 2021). The above observation indicators cover two dimensions of yield and quality, providing basic data for comprehensive evaluation.

3.3 Data processing and model: response curves, significance test and multi-objective comprehensive evaluation

The obtained data from the experiments were processed through statistical analysis and model construction (Geng et al., 2024). Firstly, regression analysis was used to draw response curves of yield, dry matter rate, sugar content, etc. to the amount of potassium fertilizer application, to identify the trends and turning points as the potassium fertilizer application amount changes (Lv et al., 2021). Through variance analysis (ANOVA) and multiple comparison tests, the significance level of differences among different potassium fertilizer treatments was determined (Singh et al., 2017). To achieve a comprehensive evaluation of yield and quality, a multi-objective comprehensive evaluation model was introduced: each indicator such as yield, dry matter rate, sugar content was processed without dimensionality (e.g., using membership functions to normalize each indicator value to the range of 0 to 1), and then the weights of each indicator were determined according to actual needs, and the comprehensive score or index was calculated (Geng et al., 2024). This comprehensive evaluation framework can quantify the overall performance of different potassium fertilizer application levels in terms of "yield-quality", helping to determine the optimal potassium fertilizer application scheme that balances high yield and high quality. In addition, this study also considers economic benefits and resource-environment factors, incorporating input-output ratios and soil nutrient balance into the analysis to ensure that the recommended fertilization amount is feasible and sustainable in practice (Geng et al., 2024).

4 Effects of Different Potassium Fertilizer Dosages on Sweet Potato Yield and Yield Components

4.1 Changes in total yield and commercial potato rate

The experimental results show that the response of total sweet potato tuber yield to potassium fertilizer dosage follows a typical pattern of "low potassium deficiency - moderate potassium sufficiency-over-limit saturation" (Singh et al., 2017; Geng et al., 2024). When no potassium fertilizer is applied or the potassium supply is severely insufficient, due to nutrient limitation, the yield of sweet potato tubers significantly decreases; as the potassium fertilizer dosage increases, the yield gradually rises, and after reaching a certain potassium application level, the yield growth tends to be saturated and a plateau period appears (Geng et al., 2024). Appropriate potassium fertilizer application results in the highest yield, but further increasing the potassium fertilizer dosage will not bring further significant yield increase; instead, it may cause a slight decline in yield gain due to nutrient imbalance (Shu et al., 2024). For example, a study investigated the potassium application effect within the range of 0 - 160 kg/ha, and found that the treatment of 80 kg K_2O/ha had the most significant increase in tuber yield, while 120 kg/ha and 80 kg/ha had similar yields, indicating that the yield increase effect decreases beyond the appropriate amount (Singh et al., 2017). Excessive potassium fertilizer may cause antagonistic absorption of other nutrients, leading to nutrient imbalance in the plant, thereby inhibiting further yield increase (Shu et al., 2024). Consistent with the yield trend, the commercial potato rate of sweet potatoes also rises first and then stabilizes with the potassium fertilizer dosage: Appropriate potassium application can increase the proportion of large tubers in the tubers, leading to an increase in the commercial potato rate; in extreme potassium deficiency, the proportion of small tubers is high, resulting in a low commercial rate; when the potassium fertilizer dosage is excessive, the commercial potato rate tends to stabilize or slightly decrease (Geng et al., 2024). In summary, rational application of potassium fertilizer is the key to increasing sweet potato yield and commercial potato rate, but blindly excessive application is difficult to continue increasing yield, and instead, it will reduce the input-output efficiency (Geng et al., 2024).

4.2 Response characteristics of root quantity, single potato weight and size grade distribution

The application of potassium fertilizer not only affects the total yield of sweet potatoes but also alters the performance of yield components (Geng et al., 2024). Firstly, at different potassium application levels, the number of tubers per plant (root quantity) and the average weight of a single tuber show different response characteristics. The study observed that the effect of increasing potassium fertilizer on the number of tubers per plant is relatively limited, but it has a significant effect on the expansion and weight increase of individual tubers (Singh et al., 2017). Under low potassium conditions, due to insufficient nutrient supply, the development of sweet potato roots is hindered, and the weight of a single potato is significantly lower, and many small and thin tubers often appear (Liu et al., 2022). With adequate potassium supply, the expansion of roots is fully supported, and the average weight of a single potato significantly increases. In this experiment, the roots produced by the medium potassium application treatment are more coarse and plump, and the fresh weight of a single potato is significantly higher than that of the potassium-free treatment, while the number of roots does not increase significantly. The increase in yield mainly comes from the increase in the weight of a single potato. This is consistent with some research reports: after potassium application, the average size of sweet potato roots increases, while the change in the number of tubers per plant is not obvious, indicating that potassium mainly improves yield by promoting root expansion (Gao et al., 2021). Secondly, the potassium fertilizer level affects the size grade distribution of roots. When potassium is deficient, the tubers produced often have inconsistent sizes, with a high proportion of small tubers and poor shapes; moderate potassium application helps to improve the regularity of root specifications, with mostly medium and large tubers, reducing the occurrence of abnormal and small tubers, thereby increasing the proportion of commercial tubers in the yield (Geng et al., 2024). In summary, increasing potassium fertilizer input can optimize the yield composition of sweet potatoes - significantly increasing the weight of a single potato and the grade of commercial products, while the effect on the number of roots is relatively small. This further supports the conclusion that potassium is mainly responsible for improving the yield of sweet potatoes by enhancing root expansion and commercial quality.

4.3 Correlation between potassium fertilizer application rate and fertilizer utilization efficiency, and harvest index

There are significant differences in fertilizer utilization efficiency and crop harvest index among different potassium fertilizer application rates (Geng et al., 2024). In terms of fertilizer utilization efficiency, moderate potassium application levels tend to achieve the highest potassium fertilizer utilization efficiency and yield increase benefits: appropriate potassium input not only meets the crop's needs but also avoids waste, maximizing the yield gain per unit of potassium fertilizer (Geng et al., 2024). In this experiment, the potassium agronomic efficiency (increase in yield per kilogram of potassium fertilizer) and potassium recovery rate of the appropriate potassium application treatment reached the highest. However, when potassium fertilizer is over-applied, due to the reduced marginal response of sweet potatoes to additional potassium, the yield increase benefit per unit fertilizer significantly decreases (Singh et al., 2017). This is consistent with field practice: excessive application of potassium fertilizer not only increases costs but also the excess potassium is difficult to be absorbed and utilized by the plants, resulting in a decrease in utilization rate (Shu et al., 2024). In terms of harvest index (Harvest Index, the proportion of root yield to biomass), sufficient potassium fertilizer can promote the allocation of dry matter to the roots, thereby increasing the harvest index (Gao et al., 2021). Under potassium deficiency conditions, the growth of the plant's aboveground and underground parts is unbalanced, and there may be a relative accumulation of stems and leaves while the distribution of roots is insufficient, resulting in a low harvest index; as potassium supply improves, more photosynthetic products are transported and stored in the roots, and the harvest index increases accordingly (Gao et al., 2021). Studies have reported that applying potassium fertilizer can increase the harvest index of sweet potatoes by approximately 10% or more compared to no potassium application, indicating that potassium effectively promotes the improvement of economic yield (Geng et al., 2024). However, when the potassium fertilizer reaches a high level, the increase in harvest index tends to level off, indicating that the dry matter distribution pattern of the plants has approached the optimal state (Shu et al., 2024). In summary, a reasonable potassium fertilizer application rate can achieve high fertilizer utilization efficiency and harvest index, achieving the best match between input and output; while too low or too high potassium application rates will reduce fertilizer utilization efficiency and are not conducive to the conversion of crop yield.

5 Effects of Different Potassium Fertilizer Dosages on Dry Matter Ratio and Starch Accumulation

5.1 Dynamic changes of dry matter ratio of potato tubers with growth stage/harvest stage

The dry matter ratio of potato tubers is an important indicator for measuring the accumulation degree of nutrients (mainly starch and other solids) in the tubers, and it varies with the growth process and harvest period (Gao et al., 2021). In the early stage of tuber expansion, the tuber volume is small and the water content is high, so the dry matter ratio is often low; as the starch and other dry substances accumulate continuously in the later growth stage, the dry matter ratio of the tubers gradually increases and reaches the highest value close to the maturity harvest (Wu et al., 2024). The dry matter ratio of tubers in each treatment of this experiment showed a trend of increasing with the growth period, but the potassium fertilizer dosage affected the rate of its increase and the final level. Appropriate potassium application can accelerate the accumulation of dry matter in tubers in the middle and later growth stages, making the tubers reach a higher dry matter ratio at the harvest stage (Gao et al., 2021). However, insufficient potassium will limit the starch synthesis in the tubers, resulting in a slow increase in dry matter ratio and possibly remaining low at maturity (Sheng et al., 2023). Observations show that the dry matter ratio of potato tubers in the medium potassium application treatment is significantly higher than that in the no-knowledge treatment at the harvest stage, proving that adequate potassium nutrition is beneficial to increasing the final dry matter content (Geng et al., 2024). On the other hand, the dry matter ratio of potato tubers in the extreme over-application potassium treatment is close to or slightly lower than that of the appropriate treatment, indicating that excessive potassium cannot further increase the dry matter ratio (Geng et al., 2024). Thus, it can be seen that the dynamic changes of the dry matter ratio of potato tubers are dominated by the growth process and significantly influenced by the potassium fertilizer nutrition level. An appropriate potassium application strategy can promote the accumulation of dry matter such as starch in tubers at the appropriate time, thereby obtaining a higher and stable dry matter ratio at the maturity harvest.

5.2 Physiological explanation for dry matter formation: photosynthetic supply, catabolic transport and storage capacity

The differences in dry matter accumulation in tubers caused by varying potassium fertilizer application rates can be explained from three aspects: photosynthetic supply, catabolic transport, and storage capacity (Gao et al., 2021). Firstly, potassium affects the supply of photosynthetic products. When potassium fertilizer is abundant, the photosynthetic efficiency of functional leaves of sweet potatoes increases, enabling the production of more organic assimilates (sugar and starch precursors), providing a continuous material basis for subsequent dry matter accumulation (Shu et al., 2024). Conversely, potassium deficiency leads to a decline in leaf photosynthetic performance, limited carbon assimilate synthesis, and a reduction in the available dry matter sources for the tubers

(Liu et al., 2022). Secondly, potassium affects the transport and distribution of assimilates. When potassium nutrition is good, the vascular tissues of the plant are developed and the osmotic potential gradient is large, facilitating the timely output of photosynthetic products from leaves and their transportation through the stem to the tubers (Jiang et al., 2024). Studies have shown that applying potassium fertilizer at the base can reduce the excessive accumulation of starch in leaves during the early growth stage, while increasing the sucrose concentration and sucrose/starch ratio in leaves in the middle and late stages, enhancing the ability of leaves to transport assimilates (Gao et al., 2021). Moreover, applying potassium can thicken the stems, increase the cross-sectional area of transport channels, and enhance the potassium concentration gradient within the stems, improving the efficiency of photosynthetic product transportation from both physical and chemical perspectives (Jiang et al., 2024). These effects enable more photosynthetic products to be smoothly transported to the tubers. Finally, potassium affects the strength of the tuber "storage". A strong storage means that the tuber has a greater capacity to accommodate and assimilate assimilates. Potassium fertilizer promotes the expansion and division of tuber cells, increases the absorption rate of assimilates by tuber tissues, and activates enzymes related to starch synthesis in the tubers, enabling the sucrose transported to the tubers to be converted into starch for storage more quickly (Gao et al., 2021). For example, applying potassium can reduce excessive starch synthesis in leaves in the early stage, ensuring more sucrose is transported as a mobile form to the tubers; at the same time, accelerating the unloading and assimilation of sucrose in the tubers, allowing the tubers to rapidly expand and accumulate dry matter (Gao et al., 2021). In summary, potassium fertilizer enhances photosynthetic source supply, promotes catabolic transport, and increases tuber storage capacity, synergistically promoting the formation and accumulation of dry matter in sweet potato tubers. This physiological process explains why applying an appropriate amount of potassium fertilizer can achieve higher dry matter yield and starch deposition.

5.3 Trade-off between dry matter rate and yield, quality, and determination of the optimal range

In sweet potato production, there is a certain trade-off relationship between the dry matter rate of the tubers and the yield and quality indicators of the fresh tubers. It is necessary to find the balance point for optimization (Geng et al., 2024). On one hand, an excessively high dry matter rate often indicates a high starch content and low water content in the tubers, which usually occurs in small tubers with limited growth. Practice shows that under extreme potassium deficiency or water shortage conditions, although the sweet potato tubers are small in size, the dry matter concentration may be relatively high (Sheng et al., 2023). However, at this time, the total yield is very low and the texture is dry, which is not conducive to the fresh food quality. On the other hand, pursuing an excessively high yield of fresh tubers sometimes leads to a decrease in the dry matter rate of the tubers (Singh et al., 2017). In experiments with a large amount of potassium chloride fertilizer, it was observed that as the yield increased, the water content of the tubers significantly increased, and the dry matter rate decreased instead (Huang et al., 2025).

This interplay between yield and dry matter rate makes maximizing a single indicator not the best strategy. In actual production, a compromise needs to be reached between the two: both a high yield and an appropriate dry matter content in the tubers are needed to ensure flavor and processing quality. Therefore, this study determined an optimal range for potassium fertilizer application through multi-objective analysis, within which the yield and dry matter rate of sweet potatoes can be maintained at a high level simultaneously (Geng et al., 2024). Specifically, under this optimal potassium application range, the fresh weight yield of sweet potato tubers is close to the maximum and the rate of commercial tubers is high, while the dry matter rate is at a moderate and slightly elevated level (neither too low to affect quality nor too high to reduce palatability). It is worth noting that the influence of different potassium fertilizer forms on the dry matter rate also needs to be considered: using sulfate potassium is beneficial for maintaining a high dry matter content while increasing yield; while potassium chloride may slightly reduce the dry matter rate while increasing yield (Huang et al., 2025). At this time, appropriate control of the dosage should be used to avoid going too far. Through the above trade-off analysis and experimental data, this study determined the optimal potassium application range that can balance the yield and dry matter (starch) content of sweet potatoes, providing a scientific basis for formulating fertilization schemes in production that both ensure yield and quality.

6 Effects of Different Potassium Fertilizer Dosages on Sugar Accumulation and Sugar Components

6.1 Changes in sugar components (such as reducing sugar and sucrose) and their significance for flavor/processing

The application of potassium fertilizers has a significant impact on the total sugar content and the proportion of various sugar components in the sweet potato tubers (Gao et al., 2021). This experiment monitored the changes in the main sugar components (reducing sugar and sucrose) in the tubers, and the results showed that the sugar composition presented a certain pattern as the potassium application level changed: moderate potassium application helps increase the sucrose content in the tubers, while potassium deficiency leads to insufficient sucrose accumulation in the tubers and a relatively higher proportion of reducing sugar (Shu et al., 2024). Literature reports indicate that moderate potassium fertilizer treatment can promote the accumulation of sucrose in sweet potato tubers, with the sucrose content in the tubers increasing by approximately 18% compared to no potassium application during the growth period (Huang et al., 2025); while in the low potassium treatment, the proportion of reducing sugar (mainly glucose and fructose) in the tubers often increases (Sheng et al., 2023). Changes in sucrose and reducing sugar content are of great significance for the flavor and processing quality of sweet potatoes. Sucrose is the main source of sweetness in sweet potatoes, and an appropriate amount of sucrose makes fresh sweet potatoes taste sweet and delicious; reducing sugar is prone to Maillard reaction during heating and processing (such as baking and frying), and excessive content can lead to overly dark color and abnormal flavor of the products (Huang et al., 2025). Therefore, for fresh and baking-type sweet potatoes, it is necessary to ensure a certain sucrose content to provide sweetness, while avoiding excessive reducing sugar to prevent excessive browning during processing. In summary, reasonable potassium fertilizer management can optimize the sugar component composition of sweet potato tubers: while increasing the total sugar content, it balances the proportion of sucrose and reducing sugar to meet the requirements of sweetness and processing quality.

6.2 Biochemical mechanism of sugar accumulation: starch-sugar conversion and key enzyme regulation

The changes in sugar content and composition of sweet potato tubers under different potassium nutrition levels result from the biochemical regulatory effect of potassium on the carbohydrate metabolism pathway of the tubers (Gao et al., 2021). Firstly, potassium affects the balance of starch and sugar conversion. When potassium is sufficient, there is an active conversion of sucrose to starch in the tubers: Adequate potassium promotes the rapid conversion of sucrose to starch for storage, increasing the accumulation of starch in the tubers and moderately reducing free sugars; while in potassium deficiency, this conversion is hindered, leading to the accumulation of soluble sugars such as sucrose and insufficient starch synthesis (Sheng et al., 2023). This process is mediated by multiple metabolic enzymes. Potassium fertilizer can enhance the activity of key enzymes in the sucrose metabolic pathway, among which sucrose synthase (SS) is the key enzyme that breaks down sucrose into substrates for starch synthesis. Experimental observations have found that the SS enzyme activity in potassium-treated tubers significantly increased, averaging an increase of approximately 16% compared to the control (Huang et al., 2025). Higher SS activity promotes the breakdown of sucrose, increasing the sugar concentration gradient between the source and sink. The increase in the gradient accelerates the transport and unloading of assimilates to the tubers, facilitating the deposition of sugar into starch (Jiang et al., 2024). At the same time, potassium may indirectly regulate the activity of sugar metabolism enzyme systems by influencing hormone balance. For example, sufficient potassium supply helps reduce the activity of starch-degrading enzymes (such as amylase, amide sugarase) in the tubers, thereby reducing excessive degradation of starch to sugars; conversely, when potassium is deficient, starch degradation increases, leading to the accumulation of reducing sugars. Other studies have also pointed out that when potassium is sufficient, the activities of enzymes promoting starch synthesis, such as ADP-glucose pyrophosphorylase and starch synthase, increase, converting more sucrose into starch chains (Gao et al., 2021). In summary, potassium fertilizer effectively promotes the conversion of sucrose to starch in the tubers and regulates the sugar accumulation pathway by up-regulating source-end enzymes such as sucrose synthase and down-regulating some sink-end enzymes. This biochemical mechanism explains why appropriate potassium application can simultaneously increase starch content and optimize the composition of sugar components, thereby improving the intrinsic quality of sweet potatoes.

6.3 Coupling relationship between sugar content, dry matter rate and starch content and quality evaluation indicators

The sugar content, dry matter rate and starch content of sweet potato tubers are closely related and jointly determine the quality characteristics of the tubers (Gao et al., 2021). Generally, the higher the dry matter rate of sweet potato tubers, the higher the starch content, as starch is the main component of dry matter; at this time, the sugar content (especially free sugar) is relatively low (Sheng et al., 2023). Conversely, sweet potato tubers with high sugar content usually have lower dry matter and starch content, and have a more moist and less fibrous texture (Huang et al., 2025). Different uses of sweet potatoes have different preferences for these indicators: for fresh consumption types (such as baked sweet potatoes and steamed sweet potatoes), generally, a moderately high sugar content and acceptable dry matter content are desired to obtain a soft and sweet taste; while for processed starch sweet potatoes, high starch (high dry matter) output is pursued, with sugar content being secondary and not too high, to increase the flour yield and product quality (Geng et al., 2024). Therefore, when evaluating the quality of sweet potato tubers, it is necessary to consider both sugar content and dry matter (starch) indicators. This study found through correlation analysis that the quality indicators of sweet potato tubers are closely related to soil nutrient supply, and sufficient soil available potassium content can simultaneously improve yield and quality indicators such as sugar content, vitamins, etc. (Shu et al., 2024). This means that appropriate potassium application can achieve a balance between yield and quality. To quantitatively evaluate the differences in quality among different potassium application treatments, we constructed a comprehensive quality evaluation index, including the sugar content (total soluble sugar content), starch content and dry matter rate of the tubers, to reflect the overall edible and nutritional quality of the tubers (Geng et al., 2024). The comprehensive evaluation results show that the quality index of the treatment with moderate potassium application is the highest, indicating that under this treatment, the sugar content of the sweet potato tubers is appropriate, the starch content is sufficient, and the texture has a balance of softness and dryness. On the contrary, the quality index of the potassium fertilizer application treatments with too low or too high potassium is lower than that of the appropriate potassium application treatment (Geng et al., 2024). The former has poor quality due to insufficient accumulation of starch and sugar, while the latter may suffer from poor texture due to overly fine or dry tubers or a loss of flavor (Huang et al., 2025). Thus, by regulating the amount of potassium fertilizer application, the coupling relationship between sugar content and dry matter (starch) of sweet potato tubers can be coordinated, achieving the optimization of quality. In research and production, introducing evaluation indicators such as sugar-starch ratio and comprehensive quality index can help select the best potassium application scheme according to different usage requirements, ensuring simultaneous improvement of sweet potato yield and quality.

7 Case Study

7.1 Case background: the typical problem of high yield fluctuation and unstable sweetness in low-sodium potassium fields

To further verify the above conclusion, this study selected a typical low-sodium potash-fertilization capacity field for case analysis (Geng et al., 2024). This field is located in a hilly area, with long-term low soil sodium potash content. During sweet potato cultivation, yield and quality problems frequently occur: during less favorable years, the root yield fluctuates significantly, and the rate of commercial sweet potatoes is low; at the same time, the sweetness of the sweet potato tubers is unstable, and in some years, the flavor of the sweet potatoes is weak, affecting the fresh eating taste. The investigation found that local growers are accustomed to applying large amounts of nitrogen fertilizer while neglecting potassium fertilizer input. This led to a long-term deficiency of potassium in the soil, coupled with the weak soil retention capacity (potassium is prone to leaching), and sweet potato production faced the dilemma of "too much fertilizer leads to unstable yield and poor flavor quality". The tested sweet potato varieties were local main-cultivated fresh-keeping varieties, and their high sugar content and moderate flouriness were the qualities favored by the market. However, on low-sodium potassium soil, this variety was unable to exert its expected yield potential and sweet aroma flavor, becoming a prominent problem restricting the industrial benefits (Gao et al., 2021). This case study was conducted to address this typical scenario, by scientifically applying potassium fertilization intervention, to explore feasible solutions for stabilizing the increase of sweet potato yield and root sweetness.

7.2 Case implementation: setting potassium fertilizer application gradient and tracking yield, dry matter rate, and sugar components

In the aforementioned low-potassium plots, a potassium fertilizer application gradient experiment was conducted to evaluate the effect of potassium management improvement (Geng et al., 2024). The experiment set multiple potassium application treatments based on a uniform nitrogen and phosphorus fertilizer application, including a no-knowledge control and several increasing levels of potassium fertilizer application (such as K_2O 0, 60, 120, 180 kg/ha, etc.), all using the commonly used potassium fertilizer varieties (sulfate potassium) for application (Singh et al., 2017). To improve potassium fertilizer efficiency and align with the peak period of sweet potato's potassium requirement, this case adopted a staged potassium application strategy: 50% of the total potassium was applied in the base fertilizer stage, and the remaining 50% was applied as a top-dressing at the time of sweet potato mulching (about 50 days after planting, before the rapid expansion of the tubers) (Shu et al., 2024). Throughout the growing season, the growth status and key physiological indicators of each treatment were regularly monitored, and yield and quality indicators were measured when the sweet potatoes were mature and harvested (Gao et al., 2021). Specific observations included: the fresh tuber yield and commercial tuber rate of each treatment; the dry matter rate and starch content of the tubers; the sugar components of the tubers (reducing sugar and sucrose content); as well as physiological parameters such as leaf potassium concentration and photosynthetic rate (Shu et al., 2024). Particularly, sensory evaluation of the sweetness or determination of soluble sugar content was conducted on the tubers before the harvest of the tubers to assess the sweetness quality (Huang et al., 2025). Through these methods, the dynamic effects of different potassium fertilizer inputs on sweet potato yield and tuber quality (especially sweetness) were tracked throughout the process, providing a basis for formulating optimized potassium application measures.

7.3 Case conclusion: identifying the optimal local range and the replicable "stage-based potassium fertilization + goal-oriented" scheme

The results of the case trial indicate that increasing the potassium fertilizer application rate significantly improves the yield stability and root quality of sweet potatoes on the low-potassium plots (Geng et al., 2024). Compared with the traditional management without potassium fertilizer application, the treatment with medium-high potassium fertilizer application significantly increases the yield of fresh sweet potatoes, reduces inter-annual fluctuations, and improves the rate of marketable potatoes, demonstrating that the investment in potassium fertilizer has a very significant yield-enhancing effect on low-potassium soil (Singh et al., 2017). At the same time, the content of soluble sugars (especially sucrose) in the roots increases with the increase in potassium fertilizer application rate (Huang et al., 2025). The sweet potatoes treated with an appropriate amount of potassium fertilizer have a significantly better sweetness than the control, and the taste evaluation improves from "plain" to "sweet" (Shu et al., 2024). Comprehensive analysis of yield and quality indicators shows that a medium-high potassium fertilizer application level within this test range achieves the best overall benefits: the yield of fresh sweet potatoes is close to the highest and stable, the dry matter rate of the roots is moderately high, the sucrose content is higher than that of the control, and the flavor and commercial value of the sweet potatoes are simultaneously enhanced (Geng et al., 2024). Further increasing the potassium fertilizer to the highest treatment does not bring significant additional benefits, indicating that there is an optimal range for potassium fertilizer application in local sweet potato production (Singh et al., 2017). Based on this, this case has determined the recommended range of potassium fertilizer application suitable for this plot and summarized a replicable and scalable "Stage-based Potassium Fertilization + Goal-oriented" fertilization scheme: potassium fertilizer is allocated reasonably according to the growth stages, meeting the needs of sweet potato expansion in the middle and later stages while preventing nutrient waste (Shu et al., 2024); and the total amount of potassium fertilizer is adjusted according to the production goals, with a medium-high potassium fertilizer application level selected for marketable sweet potato cultivation to ensure appropriate sweetness, and a higher potassium fertilizer application level selected for starch processing sweet potato cultivation (Figure 1) (Gao et al., 2021). This scheme successfully achieved high yield and high quality of sweet potatoes in the local trial, not only solving the problem of unstable yield and insufficient sweetness in sweet potatoes on low-potassium soil, but also providing a reference example for sweet potato fertilization in similar soil conditions.

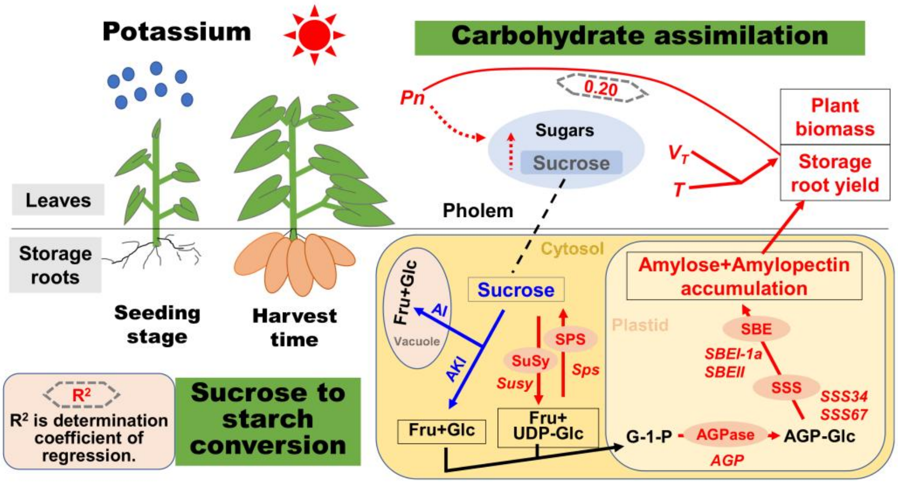

Figure 1 Increases in metabolite concentrations and enzyme activities in the K-treated sweet potato are shown in red, and decreases are shown in blue. T is the period of fast biomass accumulation phase; VT is the average biomass accumulation rate during the fast biomass accumulation duration (Adopted from Gao et al., 2021)

7.4 Practice on our farm: Applying potassium fertilizer can significantly increase the yield of fresh potatoes and the quality of commercial potatoes

In 2025, the large-scale promotion and application of high potassium fertilizer will be carried out on the Wohua Family Farm in Kaihua. The results show that the fresh potato yield will increase by 35% compared to traditional management without potassium fertilizer, and the commodity potato rate will increase by 22%, resulting in better taste. This indicates that the economic benefits of potassium fertilizer input are significant (Figure 2).

Figure 2 Sweet potato planting base of Kaihua Wohua Family Farm (Left: Planting Base; Middle: Commercial fresh tuber; Right: Boiled tuber) (Photo by Yanhong Zhong)

8 Comprehensive Evaluation, Appropriate Dosage Determination and Production Recommendations

In response to the goal of prioritizing both yield and quality in sweet potato cultivation, this study has constructed a multi-objective comprehensive evaluation framework to determine the advantages and disadvantages of different potassium application schemes. The evaluation uses membership function and composite index method: Firstly, indicators such as yield, dry matter rate of tubers, and sugar content are standardized separately to eliminate dimensional differences; then, weights for each indicator are set according to production needs (for example, yield and quality weights each account for a certain proportion), and the standardized scores are weighted and summed according to the weights to obtain the comprehensive score for each treatment. In this way, multiple indicators can be integrated into a composite evaluation index, which can be used to visually compare the overall performance of different potassium fertilizer dosage treatments. In this study, the composite index takes into account the balance of fresh potato yield (reflecting economic benefits), dry matter rate, and sugar content (reflecting quality). When a treatment performs well in all indicators, its composite index will be close to 1; if a treatment has high yield but low quality or vice versa, its composite index will be in the middle range due to the balance. The evaluation results show that the treatment with an appropriate potassium fertilizer dosage has the highest composite index, confirming that this potassium application level is the best in terms of balancing high yield and high quality. On the contrary, the composite indices of treatments with too low or too high potassium application are both low, as the former has insufficient yield and the latter has limited improvement in quality, resulting in a lower score. The multi-objective comprehensive evaluation provides a quantitative basis for determining the appropriate potassium application dosage for sweet potatoes, helping to break through the limitations of making fertilization decisions based solely on yield or a single indicator, and ensuring the simultaneous achievement of yield and quality goals.

Based on the experimental results and comprehensive evaluation, this study has proposed the appropriate application range of potassium fertilizer in sweet potato production, and provided differentiated potassium application recommendations for different types of uses. In general, for fresh consumption-type sweet potatoes (including varieties suitable for direct boiling and consumption or baking and sale), a moderately high potassium application level should be selected. Within this range, sweet potatoes can achieve higher yields while having sufficient sugar content in the tubers, ensuring a sweet and not overly dry flavor. Adequate potassium supply can also increase the vitamin and carotene content of fresh consumption sweet potatoes, further enhancing their nutritional quality. For baking-type sweet potatoes (varieties mainly used for baking), the quality evaluation focuses on a sweet and soft texture. The potassium fertilizer management for fresh consumption-type sweet potatoes can be referred to, that is, ensuring sufficient potassium to highlight the sweetness and soft texture. In contrast, for processing-type sweet potatoes (starch type), which are mainly used for starch extraction and food processing, the requirements for dry matter and starch content are higher, while sugar content is relatively less important. Such varieties should apply a higher level of potassium fertilizer to maximize tuber starch yield and dry matter accumulation. Research shows that the recommended potassium fertilizer application rate under high-yield cultivation is approximately 200 kg K_2O/ha, which can significantly increase sweet potato yield and starch content and achieve higher economic benefits. Therefore, for sweet potato varieties aimed at starch processing, the potassium fertilizer application can be increased to a level matching the high-yield requirements (such as 200 kg K_2O/ha or so), to ensure maximum starch output and optimized economic benefits. It should be emphasized that the appropriate potassium application range for different uses of sweet potatoes is not completely separate but a range interval. It should be adjusted according to the specific characteristics of the varieties, the requirements of the target product, and the soil nutrient supply conditions. In practical applications, the interval proposed in this study can be referred to, and potassium fertilizer input can be flexibly adjusted within this range to achieve specific goals such as the sweet and delicious flavor of fresh consumption sweet potatoes or the high powder and high yield of processing sweet potatoes.

When determining the potassium fertilizer application rate for sweet potatoes, both economic benefits and environmental impacts must be taken into account, and a scientifically reasonable fertilizer safety boundary should be set. Firstly, from an economic perspective, the goal should be to maximize the input-output ratio. The increase in potassium application rate must lead to an increase in yield that can compensate for the fertilizer cost and bring about an increase in net income. Research indicates that when the potassium fertilizer application rate increases from 80 to 120 kg/ha, there is no significant difference in sweet potato yield, but it increases fertilizer expenditure. Therefore, excessive potassium application will reduce economic benefits. This study also found through benefit calculation that the medium potassium application treatment achieved the highest net income, and beyond this level, the increase in unit yield is not sufficient to offset the additional fertilizer investment, resulting in a decline in economic benefits. Thus, potassium fertilizer application should have an upper limit. Applying more than the "economic optimum point" is considered an ineffective investment or even a reduction in income. Secondly, from the environmental and resource perspectives, potassium fertilizer management involves soil nutrient balance and possible environmental risks. On the one hand, insufficient potassium application over the long term will lead to excessive extraction of the potassium reserve in the soil, resulting in a negative potassium balance and subsequently affecting the production potential of subsequent crops. Meta-analysis results show that in the case of no return of sweet potato residues to the soil, more than 225 kg of potassium per hectare is required to maintain soil potassium balance; if sweet potato residues are returned to the soil, the potassium application rate should exceed 75 kg/ha to better maintain soil potassium levels. Therefore, an insufficient potassium application strategy is not advisable, otherwise soil fertility and sustainable production will be damaged. On the other hand, excessive potassium application may also bring environmental hazards and soil nutrient imbalances. Excessive application of potassium fertilizer (especially potassium chloride) may exacerbate potassium leaching, causing accumulation of salt in groundwater and other environmental problems; at the same time, potassium in the soil-plant system has antagonistic effects with calcium, magnesium, etc., and excessive potassium will inhibit the absorption of magnesium and calcium by crops, inducing relative deficiencies of magnesium and calcium. This not only affects the healthy growth of crops but also disrupts the balanced supply of soil nutrients. Given these factors, this study clearly proposed a fertilizer safety boundary when recommending an appropriate potassium application rate: the lower limit is the minimum potassium input required to support normal sweet potato growth and soil nutrient balance, and the upper limit is the maximum potassium input under the conditions of economic benefits and environmental sustainability. Applying fertilizer above the lower limit and below the upper limit can ensure high-yield and stable production of sweet potatoes while avoiding resource waste and environmental risks. By strengthening technical guidance, enabling farmers to comprehensively consider input-output and environmental costs in fertilizer decision-making, optimizing the potassium application plan, will help sweet potato production develop towards high yield, high efficiency, and green and sustainable directions.

Acknowledgments

The author is particularly grateful to the two anonymous peer reviewers for their thorough evaluation of the manuscript.

Conflict of Interest Disclosure

The author affirms that this research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

References

Aboyeji C.M., Adekiya A.O., Dunsin O., Adebiyi O.T.V., Aremu C.O., Olofintoye T.A.J., Ajiboye B.O., and Owolabi I.O., 2019, Response of soil chemical properties, performance and quality of sweet potato (*Ipomoea batatas* L.) to different levels of K fertilizer on a tropical alfisol, The Open Agriculture Journal, 13: 58-66.
https://doi.org/10.2174/1874331501913010058

Duan W., Wang Q., Zhang H., Xie B., Li A., Hou F., Dong S., Wang B., Qin Z., and Zhang L., 2018, Differences between nitrogen-tolerant and nitrogen-susceptible sweetpotato cultivars in photosynthate distribution and transport under different nitrogen conditions, PLOS ONE, 13(3): e0194570.
https://doi.org/10.1371/journal.pone.0194570

Etana G.G., 2019, Growth, Yield and Nutritional Quality of Sweet potato (*Ipomoea batatas* (L.) Lam) Varieties as Influenced by Fertilizer type and Rates: A Review, Greener Journal of Soil Science and Plant Nutrition, 6(1): 15-24.
https://doi.org/10.15580/GJSSPN.2019.1.062119114

Gao Y., Tang Z., Xia H., Sheng M., Liu M., Pan S., Li Z., and Liu J., 2021, Potassium Fertilization Stimulates Sucrose-to-Starch Conversion and Root Formation in Sweet Potato (*Ipomoea batatas* (L.) Lam.), International Journal of Molecular Sciences, 22(9): 4826.
https://doi.org/10.3390/ijms22094826

Geng J., Zhao Q., Li Z., Yang X., Lei S., Zhang Q., Li H., Lang Y., Huo X., and Liu Q., 2024, Effects of various potassium fertilizer dosages on agronomic and economic assessment of sweet potato fields, Horticulturae, 10(1): 44.
https://doi.org/10.3390/horticulturae10010044

Huang J., Wang Q., Qiu Q., Zou L., Shen X., Wan Y., and Qu H., 2025, Anthocyanin biosynthesis, quality, and yield in purple sweet potatoes: responses to different potassium fertilizer, Physiologia Plantarum, 177: e70247.
https://doi.org/10.1111/ppl.70247

Jiang Z., Wei Z., Zhang J., Zheng C., Zhu H., Zhai H., He S., Gao S., Zhao N., Zhang H., and Liu Q., 2024, Source-sink synergy is the key unlocking sweet potato starch yield potential, Nature Communications, 15: 7260.
https://doi.org/10.1038/s41467-024-51727-6

Liu J., Xia H., Gao Y., Pan D., Sun J., Liu M., Tang Z., and Li Z., 2022, Potassium deficiency causes more nitrate nitrogen to be stored in leaves for low-K sensitive sweet potato genotypes, Frontiers in Plant Science, 13: 1069181.
https://doi.org/10.3389/fpls.2022.1069181

Lv Z., and Lu G., 2021, A new curve of critical leaf potassium concentration based on the maximum root dry matter for diagnosing potassium nutritional status of sweet potato, Frontiers in Plant Science, 12: 714279.
https://doi.org/10.3389/fpls.2021.714279

Sharmin S., Arfin M.N.H., Tareque A.M.M.U., Kafi A.A., Miah M.S., Hossen M.Z., Talukder M.A.S., and Robin A.H.K., 2024, Reduction of potassium supply alters the production and quality traits of ipomoea batatas cv. BAU sweetpotato-5 tubers, Stresses, 4(4): 59.

Sheng M., Xia H., Ding H., Pan D., He J., Li Z., and Liu J., 2023, Long-term soil drought limits starch accumulation by altering sucrose transport and starch synthesis in sweet potato tuberous root, International Journal of Molecular Sciences, 24(3): 3053.
https://doi.org/10.3390/ijms24033053

Shu X., Jin M., Wang S., Xu X., Deng L., Zhang Z., Zhao X., Yu J., Zhu Y., Lu G., and Lv Z., 2024, The effect of nitrogen and potassium interaction on the leaf physiological characteristics, yield, and quality of sweet potato, Agronomy, 14(10): 2319.
https://doi.org/10.3390/agronomy14102319

Singh P., Aravindakshan K., Maurya I., Singh J., Singh B., and Sharma M., 2017, Effect of potassium and zinc on growth, yield and economics of sweet potato (*Ipomoea batatas* L.) cv. CO-34, Journal of Applied and Natural Science, 9(1): 291-297.
https://doi.org/10.31018/jans.v9i1.1186

Walter R., Rajashekhara Rao B.K., and Bailey J.S., 2011, Distribution of potassium fractions in sweet potato (*Ipomoea batatas*) garden soils in the Central Highlands of Papua New Guinea and management implications, Soil Use and Management, 27(1): 77-83.
https://doi.org/10.1111/j.1475-2743.2010.00313.x

Wu Y., Jin X., Wang L., Lei J., Chai S., Wang C., Zhang W., and Yang X., 2024, Integrated transcriptional and metabolomic analysis of factors influencing root tuber enlargement during early sweet potato development, Genes, 15(10): 1319.
https://doi.org/10.3390/genes15101319