香蕉是一種需要大量鉀元素的經濟作物，本研究的目標是透過台灣地區不同品種之香蕉植體，與所對應之土壤與環境水體，探討不同品種香蕉、土壤與環境水體樣本之鉀元素與放射性鉀-40 活度的關係。根據研究檢測數據得知香蕉植體放射性鉀-40 活度以香蕉皮 1,838±269 Bq/kg(平均值±標準差，n=40) 為最高，其次是香蕉葉的 1,174±423 Bq/kg(平均值±標準差，n=40)，而香蕉果肉的活度 457±146 Bq/kg(平均值±標準差，n=40)為最低；其中香蕉葉的放射性鉀 40 活度分佈的變異性最大，香蕉皮則是最小。在所有香蕉植體(香蕉葉、香蕉皮與香蕉肉)部位的放射性鉀-40 活度與對應 XRF 鉀檢測濃度值具有顯著的線性關係，本研究結果得知香蕉植體(香蕉葉、香蕉皮與香蕉肉)部位的放射性鉀-40 活度檢測值與所對應 XRF 鉀檢測濃度值不因為香蕉植體部位的不同而有所差異。利用高純鍺偵檢器所測得的香蕉植體放射性鉀-40 活度來推估理論鉀濃度值的數據資料得知，該值與香蕉植體 XRF 鉀濃度值相當，兩者的線性方程式為 $y_3=1.016x_3+525.6$ (R^2=0.993，n=120)；而土壤放射性鉀-40 活度推估鉀濃度的結果明顯與土壤 XRF 鉀濃度差異甚大，原因可能是土壤樣本的基質組成遠比香蕉植體(香蕉果肉、葉、皮)要來得複雜，使得在土壤的 XRF 檢測鉀濃度值受到基質的干擾遠大於香蕉植體，因而導致上述兩者的線性相關性產生差異的現象。本研究得知利用這種非破壞性的高純鍺偵檢器檢測技術，將香蕉植體所含放射性鉀-40 推估香蕉的鉀濃度分佈的方法，可以進一步確認香蕉植體鉀濃度的實際流佈現況。對於日後香蕉施鉀肥用量的評估與栽種方法的改善，提供另一種安全又可靠的研究方法。

關鍵詞：香蕉、放射性鉀-40、高純鍺偵檢器

Abstract

Banana is an economic crop that requires a lot of potash fertilizer. The research goal of this study is to explore the relationship between potassium and radioactive potassium-40 activity in different varieties of bananas, soil and environmental water samples through different varieties of banana plants in Taiwan and the corresponding soil and environmental water bodies. According to the research data, it is known that the activity of radioactive potassium-40 in banana plants is 1,838±269 Bq/kg (mean±standard deviation, n=40) of banana peel is the highest, followed by banana leaves at 1,174±423 Bq/kg (The average value ± standard deviation, n=40), and the banana pulp activity of 457 ± 146 Bq/kg (mean value ± standard deviation, n=40) is the lowest. Among them, the variability of the activity distribution of radioactive potassium 40 in banana leaves is the largest, and its corresponding in the banana peels is the smallest. In all banana plants (banana leaves, banana peels and banana pulp), the K40 activity has a significant linear relationship with the corresponding XRF K detection concentration value. The results of this study show that the radioactive potassium-40 activity detection value of the banana plants, correspond-ding XRF potassium detection concentration value are not different due to the different banana plant parts. Using the radioactive potassium-40 activity value of banana implants measured by the high-purity germanium detector to estimate the theoretical potassium concentration data, it is known that these values are equivalent to the potassium concentration of banana plants detected by XRF, and their linear equation is $y_3=1.016x_3+525.6$ (R^2=0.993, n=120). The matrix com-position of the soil sample is much more complicated than that of banana plants, which makes the XRF detection of potassium in the soil much more interfered by the matrix than banana plants, which leads to the correlation between the two Phenomena that produce different differences. This study learned that using this non-destructive high-purity germanium detector detection technology to estimate the potassium concentration distribution of the banana plant radioactive potassium-40 contained in the banana plant can further confirm the actual potassium concentration of the banana plant Current status of the spread. It provides another safe and reliable research method for the evaluation of the amount of potassium fertilizer applied to bananas and the improvement of planting methods in the future.

Keywords: Banana; Radioactive potassium-40; High-purity germanium detector