*Plant Archives* Vol. 19, Supplement 2, 2019 pp. 1603-1605 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

# STUDIES ON THE INFLUENCE OF POTASSIUM ON GROWTH, YIELD AND QUALITY OF HILL BANANA VAR. SIRUMALAI

**Sathappan C.T., K. Sivanesh and D. Dhanasekaran***

Department of Horticulture and Department of Agronomy, Faculty of Agriculture,
Annamalai University Annamalainagar, Tamilnadu-608002, India

## Abstract

A field investigation was carried out to study the influence of potassium on growth, yield and quality of Hill banana *var.* Sirumalai" at Sirumalai hills in Dindugul district during the year 2016-2018. The experiment was laid out in a randomized block design with nine treatments replicated thrice. The treatments included graded levels of K (@ 390g as control, 450g, 500g, 550g and 600 g/plant) and foliar spray of Sulphate of Potash (SOP @1.5 % twice at 15 days interval after bunch emergence along with four levels of K excluding control). The growth, flowering and quality parameters were periodically observed. In general, increase in graded level of K application has enhanced the growth and yield parameters. Treatments with foliar application of SOP showed significant influence when compared with soil application of K alone. Further, the results revealed that the growth characters *viz*., pseudostem height, pseudostem girth, number of leaves per plant were favorably enhanced by the combined application of K @ 550 g/plant + SOP foliar spray twice @ 1.5%, which was followed by K @ 600 gm/plant + SOP foliar spray twice @ 1.5%. The yield parameters *viz*., days to bunch harvest, number of fingers per bunch, number of hands per bunch, weight of second hand per bunch, total number of fingers in second hand per bunch, bunch weight and estimated yield were also found to be influenced by foliar application of K. Among the treatments application of K @ 550 gm/plant + SOP foliar spray twice @ 1.5% recorded the maximum values for all above said characters. The quality parameters *viz*., middle finger length (cm) and middle finger diameter (cm) of the second hand, TSS and total sugars were also found to be influenced by foliar application of K. The results suggested that application K @ 550 gm/plant + SOP foliar spray @ 1.5% twice at 15 days interval after bunch emergence as the best treatment to increase yield and quality of Hill banana *var.* Sirumalai"

***Keywords*** **:** Foliar spray, Hill Banana, Potassium, Quality parameters

## Introduction

Banana (*Musa paradisiaca* L.) is the cheapest and most nourishing of all fruits, belonging to the family Musaceae, of the order Scitaminae. Most of the edible bananas and plantains are indigenous to warm, moist regions of Tropical Asia, comprising few parts of India, Thailand and Indochina. In India, banana is aptly referred as '*Kalpatharu*', a plant of all merits that each and every part of the plant is used for specific purposes. Apart from its use as a dessert fruit and for culinary purposes, the banana plant has multifaceted uses: the leaf is commonly used as a hygienic dining plate; the male flower as a favourite vegetable; the inner core of the pseudostem is a popular vegetable with many therapeutic uses; the sap is used as an indelible ink in industry and the underground rhizome is exploited as animal feed in a composite mixture with other feedstuffs (Singh and Uma, 1996). Banana is easily digestible and rich in carbohydrate (27 %), vitamins (β-Carotene, riboflavin, niacin, ascorbic acid) and minerals (K, P, Mg, Ca, Fe) (INIBAP, 1987). Presently, India tops in the area with 0.80 m ha of cultivation and 29.2 m. tonnes production, with a productivity of 37.04 t/ha. India shares 15% of the world area and 25% of the world production. Although the area and production is more in Tamilnadu it falls in the 8$^{th}$ place in productivity. Hill banana is a very important crop and it had been the ruling crop of lower palani's, sirumalai hills from 1940-1975.

Banana takes more nutrients per unit area than almost any other crops (Martin-Prevel, 1973). Function of potassium in advancing flowering and shortening the number of days for maturity in banana has been reported by Lahav and Turner (1983). In Dwarf Cavendish banana, EL-Khoreiby and Salem (1991) observed the highest plant height and basal circumference were recorded with K application @ 500 g $K_2O$ / plant. At this rate the plants were more vigorous and there was greater leaf area. Baruah and Mohan (1991) observed highly significant effect of K on leaf area index and phyllochron. Hence, an optimum supply of K must be essential in maintaining normal growth and developments, especially during the later stages of K fruit development (Munson, 1985). The increase in the N and K fertilization levels improved the growth parameter of plant and had positive response to higher K application after flowering. (Chandrakumar *et al*., 2001). Banana requires more K for its growth, production and quality compared to N and P. Banana, being a potassium loving crop, the farmers in India are applying K @ 800 to 1600 kg/ha depending upon the availability soil K. As MOP is commonly used as the source of K, chloride toxicity is often seen in bananas, hindering the crop growth, yield and quality. (Nalina, 2002). The present study was under taken with the objective to evaluate the effect of K fertilizers on growth, yield and quality of hill banana *var.* Sirumalai.

## Materials and Methods

The study was carried out during the year 2016-17 in Sirumalai Hills, which is located in the western offshoot of the Eastern Ghats. The commercially adopted variety Sirumalai hill banana was selected for the present investigation. The experiment was laid out in the Randomized Block Design (RBD) with nine treatments and replicated thrice. Sword sucker of 2-3 Kg in weight were used as planting materials. The base of the rhizome was cleaned mostly by pruning the old roots and kept in shade for 2 days for drying up the wound areas and planted at a spacing of 3.6 x 3.6 m. A fertilizer schedule of 120:45g/plant of NP was applied as common dose for all the treatments with variable K rates. The treatments included graded levels of K

(@ 390g as control, 450g, 500g, 550g and 600 g/plant) and foliar spray of Sulphate of Potash (SOP @1.5 % twice at 15 days interval after bunch emergence along with four levels of K excluding control). N was supplied in three equal splits and P was supplied in the 3rd month. K was given as per treatment in three split doses of 3rd, 5th and 7th months after planting. Spraying of Sulphate of Potash (SOP) was done twice first immediately after last hand opening and second spray was done at 15 days interval after the first spray to the respective treatments. Data on the following growth and yield contributing characters *viz.,* pseudo stem height, pseudo stem girth, number of leaves plant$^{-1}$, days taken for bunch emergence, days to bunch harvest, number of hands bunch$^{-1,}$ number of fingers bunch$^{-1}$,weight of second hand bunch$^{-}$ , number of fingers per second hand, bunch weight, estimated yield per hectare**,** middle finger length of second hand, middle finger diameter of second hand , total soluble solids and total sugars were recorded from five randomly selected plants from each plot during the course of the experiment. The data recorded were subjected to statistical analysis by adopting the standard procedure of Panse and Sukhatme (1978).

## Results and Discussion

### Growth characters

Result of the present investigations envisaged that application of enhanced level of 'K' significantly influenced all growth characters of Hill banana when compared to control. In general, increase in graded level of K application has enhanced the growth parameters. Treatments with foliar application of SOP showed significant influence when compared with soil application of K alone. The growth characters including pseudostem height, pseudostem girth, number of leaves per plant and days taken for bunch emergence were significantly influenced due to soil application of K and foliar application of SOP. The effect of different levels of Potassium fertilizers on pseudostem height and pseudostem girth was statistically significant at all stages of the crop. The pseudostem height and pseudostem girth were increased gradually with enhancement in soil applied K levels. However, when foliar spray of SOP is combined with soil applied potassium, the growth enhancement was observed only up to 550 g per plant levels of K. Further enhancement of K application (600 g / plant) along with foliar application of SOP has negative effect. The maximum pseudostem height (551.24 cm) and pseudostem girth (71.29 cm) were recorded in K @ 550 g per plant + SOP foliar spray twice @ 1.5% and the minimum pseudostem height (332.42 cm) and pseudostem girth (45.32 cm) were recorded in control (K@390 g per plant) (Table 1). This finding is in agreement with the findings of Ram kumar and Rajan (1998) and Chandrakumar *et al*., (2001) who reported improvement in the growth characters of plants due to increased K levels.

When foliar application of SOP was combined with basal K, the number of leaves was increased up to 550gm/plant. The maximum number of 49.75 leaves/ plant observed in K @ 550gm/plant + SOP foliar spray twice @1.5% was followed by K @ 450 gm/plant + SOP foliar spray twice @ 1.5%. In present study, foliar application of SOP had a significant role in enhancing growth attributes and it has reduced soil application level from 600g/plant to 550 g/plant to obtain highest growth attributes. Ultimately combined application of soil and foliar K enhanced the growth. This enhancement in growth might be due to the reason that potassium is important to maintain respiration and improve photosynthesis. Munson (1985) who reported the increased number of green leaves with increasing supply of N and K respectively. Teixeira *et al*. (2001) found that irrigation and accurate N and K fertilization are useful for increasing the life span of banana leaves. Reduced growth attributes recorded in present study due to low K levels is in line with Lahav (1972) who observed that K starvation significantly reduced leaf area, longevity, pseudostem height and girth. Significant increase in pseudostem height, girth and sucker production were observed with increase in K nutrition in Robusta banana by Mustaffa (1996).

Bunch emergence in hill banana is most important character that exhibits physiological readiness of plant to partition photosynthetic products towards sink portion. In present experiment, the number of days taken for bunch emergence was significantly reduced due to soil K application along with foliar application. Significantly earlier bunch emergence was recorded with K @ 550 g per plant + SOP foliar spray twice @ 1.5% treatments. In line with the present results role of K in advancing flowering and shortening the number of days for maturity in banana has been well documented by many workers (Lahav and Turner, 1983; Chandrakumar *et al*., 2001).

### Yield characters

The yield parameters such as days to bunch maturity, number of hands per bunch, number of fingers per bunch, weight of second hand per bunch, bunch weight, yield per plant and estimated yield per ha were significantly enhanced due to increased soil application of K up to 600 g per plant. When foliar application of SOP twice @ 1.5% was supplemented with soil application of K the yield enhancement was incremental only up to K @ 550 g per plant. Significantly highest yield parameters *viz.,* number of hands per bunch (7.24), bunch weight (13.84 kg), weight of second hand per bunch (1.67 kg /plant) and Estimated yield per ha (10.3 t/ha) were recorded with application of K @ 550 g per plant + SOP foliar spray twice @ 1.5% treatments (Table 2). The next best treatment in terms of yield attributes was K @ 500 g per plant + SOP foliar spray twice @ 1.5% and it was followed by K @ 600 g per plant + SOP foliar spray twice @ 1.5%. These yield attributes were recorded the least in control plots which received K @ 390 g per plant. The yield enhancement observed in treatment with K @ 550 g per plant + SOP foliar spray twice @ 1.5% (10.30 t/ha) was 60 per cent higher when compared with the yield realized from control plots (6.45 t/ha).

Enhancement of yield due to higher levels of K application observed in present study is in line with earlier reports of Baruah and Mohan (2001). Fruit growth is conspicuously restricted by low potassium supply. Thus, low potassium supply produces 'thin' fruit and fragile bunches. Further, an adequate supply of K enhanced $NH_4$ utilization, thus improving crop yields (Hagin *et al.,* 1990). Further, Potassium is the macronutrient extracted in greater amounts by banana plants (62% of the total macronutrient and 41% of the plant nutrients), which directly affects photosynthesis, the translocation of photosynthates and the water balance in plants and fruits (Kumar and Kumar, 2008; Moreira, 1999).

**Quality characters**

The quality characters *viz.,* middle finger length of the second hand, middle finger diameter of the second hand, TSS content and Total sugars were recorded the highest due to enhanced levels of K application. The highest middle finger length of the second hand (18.57cm), middle finger diameter of the second hand (12.59 cm), TSS content (28.67° brix) and Total sugars (20.13 %) were recorded in treatment with K @ 550 g per plant + SOP foliar spray twice @ 1.5% (Table 2).

In high value crop species like banana quality standards have become the most important factor influencing a monetary yield and farmer's income. In bananas, fruit quality is mainly judged by the central finger length and its diameter of the second hand, TSS and Total sugars. A marked effect on fruit quality was observed in the present study due to varying levels of K and foliar application of SOP. Higher fruit quality observed in terms of sugar content can be explained by the role of K which is involved in carbohydrate synthesis, breakdown and translocation and synthesis of protein and neutralization of physiologically important organic acids (Tisdale and Nelson, 1966).

From the above discussed results and facts it could be concluded that the growth, yield and quality of the Hill banana can be enhanced by the soil application of K @ 550 g per plant along with SOP foliar spray twice @ 1.5%.

## References


Lahav, E. (1972). Effect of different amounts of potassium on the growth of Banana. Trop. Agric. Bet. Dagan, Israel. 49(4): 321-325.

Moreira, R.S. (1999). Banana : teoria e pratica de cultivo (2a ed., CD ROM) Campinas, Sp: Fundacao Cargill.

Teixerira, L.A.; Rliggiera, J.C. and Natale, W. (2001). Maintaining leaves of Banana manico by managing nitrogen and potassium fertilizers and irrigation. Revista- Brasileria-de-fruitculatura, 23(3): 699-703.

Baruah, P.J. and Mohan, N.K. (2001). Effect of potassium on yield attributing character of Banana. Haryana, J. Hort. Sci., 30(3/4): 205-206

Chandrakumar, S.S.; Thimmegouda, S.; Srinivas, K. and Reddy, B.M.C. (2001). Performance of Robusta Banana under Nitrogen and Potassium Fertilization. South Indian Hort., 49: 92-94.

Hagin, O.S.R. and Shaviv, A. (1990). Review of interaction of ammonium nitrate and potassium nutrition of crops. J. Plant Nutrition, 13(10): 1211-1226.

INIBAP (1987). International Network for the improvement of Banana and Plantain. Montpellier Cedex (France): pp.8-9.

Kumar, A.R. and Kumar, N. (2008). Potassium nutrition in Banana. The Asian J. of Horticulture, 3(2): 479-482.

Lahav, E. and Turner, D.W. (1983). Banana nutrition. IPI-Bulletin No. 7 International Potash Institute, Bern, Switzerland, p.33.

Martin-Prevel, P. (1973). Influence of potassium nutrition on physiological functions and production of plantains in tropical region. pp.233-248. In: 10th colloquium on the international potash institute, Abidjan, Ivory coast.

Munson, R.S. (1985). Potassium in Agriculture Madison, Wisconsin USA, p.550.

Mustaffa, M.M. (1996). Influence of potassium nutrition on growth, yield and quality of Banana. In: Proceedings of the conference on "Challenges for Banana production and utilization in 21st century" held on 24-25 September, 1996, Trichirapalli, 338.

Nalina, L. (2002). Standardization of fertilizer requirement for tissue cultural Banana *CU*. Robusta (AAA). Ph.D. (Hort.) Thesis, Tamil Nadu Agri. University, Coimbatore.

Panse, V.S. and Suhktame, P.V. (1967). Statistical Methods for Agricultural Workers, ICAR, New Delhi, 152-155.

Ram, K. and Rajan, S. (1998). Effect of potassium growth yield and quality of Ratoon crop of Banana. *CU*. Dwarf Cavendish J. Potassium. Res. 14(1/4): 115-118.

Singh, H.P. and Uma, S. (1996). Banana cultivation in India, National Research Centre for Banana, Tiruchirapalli, India. Tisdale, S.L. and Nelson W.L. 1966. Soil fertility and fertilizers, Macmillan Co., London. 81p.

Lahav, E. and Turner, D.W. (1983). Banana nutrition. IPI-Bulletin No.7. International Potash Institute, Bern, Switzerland, 33.

EL-Khoreiby, A.M.K. and Salem, A.T. (1991). Effect of potassium on the vegetative growth and the nutritional status of Dwarf Cavendish banana. Hort. Abstr., 42(1): 247-258.

Baruah, P.J. and Mohan, N.K. (1991). Effect of potassium on leaf area index, phyllochron and number of leaves of banana cv. Jahaji. Banana News Lett., 14 : 21-22.