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Panchal RK
Ph.D. Scholar, Dept. of Fruit Science, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Patil SJ
Research Scientist (Horticulture), Agriculture Experimental Station, Navsari Agricultural University, Paria, Gujarat, India

Chawla SL
Associate Professor, Dept. of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Tandel BM
Associate Professor, Dept. of Fruit Science, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Gaikwad SS
Associate Professor & Principal, Horticulture Polytechnic, Navsari Agricultural University, Paria, Gujarat, India

Corresponding Author:
Panchal RK
Ph.D. Scholar, Dept. of Fruit Science, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Effect of foliar application of silicon on growth of banana (*Musa paradisiaca* L.) cv. Grand Nain

Panchal RK, Patil SJ, Chawla SL, Tandel BM and Gaikwad SS

Abstract
The present experiment was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2017-18 and 2018-19. An experiment was laid out in a randomized block design, comprising of three levels of potassium silicate and silicic acid (1, 2 and 3 ml/l/plant) along with control. The treatments were replicated thrice. The effects of foliar applications at 2nd, 3rd and 4th months after planting of different levels of potassium silicate and silicic acid on growth of banana cv. Grand Nain were recorded. The results indicated that foliar application of potassium silicate @ 3ml/l/plant at 2nd, 3rd and 4th MAP recorded significantly the maximum growth characters at various stages of growth of banana *i.e.* pseudostem height, girth and number of functional leaves of banana plant at 5th and 7th MAP whereas, leaf area was found non-significant.

Keywords: Potassium silicate, silicic acid, pseudostem and leaf area

Introduction
Banana is a heavy feeder of nutrients and thus need balanced nutrition for optimum growth and fruit production and in turn potential yields. A deficiency or excess of nutrients can cause substantial damage to the plant. Studies have clearly demonstrated that for high productivity of banana, application of recommended dose of essential nutrients at appropriate growth stage is necessary (Thangaselvabai *et al*., 2009) [5]. Further the crop well responds to micronutrient and some of the beneficial element like silicon. Silicon is not considered as an essential element, but it has positive growth effect including increased dry mass and yield, enhanced pollination and most commonly increased disease resistance (Gillman *et al.*, 2003) [1]. The role of silicon in plant biology is known to tolerate multiple stresses including biotic and abiotic stresses. It is also known to increase drought tolerance in plants by maintaining plant water balance, photosynthetic activity and erectness of leaves and structure of xylem vessels regulating transpiration rates (Melo *et al*., 2003) [2].

Material and methods
The present experiment was conducted at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2017-18 and 2018-19. An experiment was laid out in a randomized block design, comprising of three levels of potassium silicate and silicic acid (1, 2 and 3 ml/l/plant) along with control. The treatments were replicated thrice. The effects of foliar applications at 2nd, 3rd and 4th months after planting of different levels of potassium silicate and silicic acid on growth of banana cv. Grand Nain were recorded.

Results and Discussion
An understanding of plant growth and its different parameters in quantitative terms is essential to interpret crop yields in banana. From the present investigation, different treatments of silicon could not exert a significant influence on psedostem height at 7th month after planting. It was observed that there was significant response of pseudostem height in the foliar application of potassium silicate @ 3ml/l/plant sprayed at 2nd, 3rd and 4th MAP (T_4) at 5th month after planting in banana cv. 'Grand Nain'. A thicker pseudostem is desirable in banana as it offers better anchorage to the plants. In the present experiment, significantly the highest pseudostem girth was recorded in the foliar application of potassium silicate @ 3ml/l/plant at 2nd, 3rd and 4th MAP (T_4) at 5th and 7th MAP. This increased in pseudostem height and girth might be due to through the role of silicon in both cell division and cell expansion by its effect

on RNA and DNA synthesis, increased in photosynthetic activity and accumulation of more carbohydrates in the pseudostem (Sivanesan and Park, 2014) [3].

Banana should produce sufficient number of leaves to harness the light energy and synthesize adequate photosynthesis for biomass production. In the present investigation, significantly maximum numbers of functional leaves per plant and leaf area were recorded in foliar application of potassium silicate @ 3ml/l/plant sprayed at 2nd, 3rd and 4th MAP at 5th and 7th MAP.

The increased in number of leaves per plant and leaf area might be due to stimulation of growth by the silicon application. It's also helps in maintenance of upright growth habit and allowed maximum light interception, came from the structural components of the plants cell walls and increased photosynthetic activity as well as leaf chlorophyll content (Smith, 2011) [4].

Table 1: Effect of foliar application of silicon on growth in banana cv. Grand Nain (mean of two years)

Treatments		Pseudostem height (cm)		Pseudostem girth (cm)		Number of functional leaves per plant		Leaf area (m^2)	
		5th MAP	7th MAP	5th MAP	7th MAP	5th MAP	7th MAP	5th MAP	7th MAP
T_1	Control	90.83	171.58	36.79	52.04	12.29	13.96	9.85	17.40
T_2	Potassium silicate @ 1ml/l/plant	101.50	173.71	38.46	54.04	12.38	14.25	10.48	17.85
T_3	Potassium silicate @ 2ml/l/plant	107.42	176.17	40.67	56.33	12.96	15.08	10.63	18.48
T_4	Potassium silicate @ 3ml/l/plant	118.29	188.13	46.88	60.08	14.92	17.00	11.07	19.82
T_5	Silicic acid @ 1ml/l/plant	99.13	175.71	38.33	55.58	12.50	14.63	10.46	18.28
T_6	Silicic acid @ 2ml/l/plant	109.83	178.58	42.08	57.83	13.58	15.71	10.80	18.65
T_7	Silicic acid @ 3ml/l/plant	113.17	182.75	44.00	58.42	14.00	16.04	10.97	19.38
S Em ±		3.25	5.30	1.47	1.70	0.40	0.50	0.35	0.59
CD 0.05 %		9.38	NS	4.25	4.91	1.16	1.45	NS	NS
Interaction (Year × Treatments)									
S Em ±		5.02	8.37	2.32	2.68	0.63	0.79	0.54	0.94
CD 0.05 %		NS	NS	NS	NS	NS	NS	NS	NS
CV %		8.22	8.15	9.80	8.24	8.29	9.03	8.85	8.74

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