



# A Study of Water Soluble Fertilizers and Micronutrients on Pseudostem height of Banana (CV. Grand Nain)

Patil S A

Yeshwant Mahavidyalaya, Nanded – 431602 (M.S.), India

## ABSTRACT

During the present studies Different water soluble treatments with and without micronutrients treatments were applied to the banana plants of grand nain cultivar. The treatments were applied for two years. The fertilizer treatment applied by conventional methods was served control. During two trial years. The pseudostem height was measured at one foot above the ground level with the help of measuring tape after three, six and nine months of planting during first year and second year. The results were recorded accordingly, pooled analysis and the statistical analysis were worked out. From the results it is evident that the pseudostem height of the test banana plants under different water-soluble treatments gradually increased with the increase in growing period during both first and second year. It was interesting to note that the pseudostem height of the test plants under fertilizer treatment with micronutrients was found to be more

### Introduction:

The banana (*Musa paradisiaca* L.) an important fruit crop of the world. It is consumed by human beings since centuries long back. It is known to be mans first food and hence called it as Adams fruit. It is highly nutritious. It is cheap and hence nicknamed as **poor man's apple**. Apart from using banana as food, the fruit, leaves and other plant parts are used in several occasions and religious purposes. It is evident from the literature that there are about 250-300 cultivated banana varities in India. About 90 per cent farmers in Nanded district used to grow grand nain cultivar. Grand Nain is suitable for Nanded region in terms of vigour, yield, quality and long shelf-life. The yield and quality of banana requires vegetative growth and good vegetative growth requires recommended dose of macro and micronutrients. The macronutrients (Nitrogen, Phosphorous and Potassium) promote vegetative growth and production. The micronutrients in small dose promote enzymatic activities and synthesis resulting into high yield and quality (Kumar, 2002, Das, 2003)

Considering these facts the research topic entitled Effect of Water Soluble Fertilizers and Micronutrients on Pseudostem height and diameter of Banana (*Musa paradisiaca* L.) is related to the present studies.

## Materials and Methods

During the present studies different treatments of water soluble fertilizers were applied to the plants of test banana cultivar during two trial years. The plants under conventional method of application of fertilizers were served as control during two trial years. The height of pseudostem of the test banana cultivar was measured at 1 feet above the ground level with the help of measuring tape 3, 6 and 9 months of planting during first year and second years. The results were recorded accordingly statistical and pooled analysis also worked out.

## Treatment Details

The details of application of fertilizers scheduled during the research work is

Treatments	Treatment Details
<b>I. Main Plot treatments</b>	
M <sub>1</sub>	50 % RDF through WSF (12:61:00, 13:0:45 and Urea)
M <sub>2</sub>	75 % RDF through WSF (12:61:00, 13:0:45 and Urea)
M <sub>3</sub>	50% RDF through WSF (Urea, Orthophosphoric acid and White potash)
M <sub>4</sub>	75% RDF through WSF (Urea, Orthophosphoric acid and White potash)
M <sub>5</sub>	100 % RDF through soil application (Urea, SSP and MOP)
<b>II. Sub-Plot treatments</b>	
S <sub>0</sub>	Without micronutrients
S <sub>1</sub>	With micronutrients
<b>Replications</b>	4 (Four)
<b>Design</b>	Split plot Design (SPD)
<b>Year (Seasons)</b>	Two (2015-16 and 2016-17)
<b>Location</b>	A/P Pardi (Mukta) Tq. Ardhapur Nanded district of Maharashtra state
<b>Crop and Cultivar</b>	Banana Cv. Grand Nain
<b>Spacing</b>	Row to row 1.8 meters and plant to plant 1.5 meters
<b>Number of plants/treatment</b>	16
<b>Total number of plants</b>	640
<b>Total number of treatments</b>	10 (Main plot treatments 5 x Sub-plot treatments 2)

WSF = water soluble fertilizers through fertigation

RDF = Recommended Dose of Fertilizer (200:160:200 grams NPK per plant)

NPK=Nitrogen, Phosphorous and Potassium

SSP=Single Super Phosphate

MOP=Murate of potash

## Results and Discussion

### Studies on application of water soluble fertilizers and micronutrients in relation to pseudostem height during growing period of Grand Nain cultivar of Banana.

For the present studies water soluble fertilizer treatments ( $M_1$ ,  $M_2$ ,  $M_3$  and  $M_4$ ) with and without micronutrients treatments ( $S_1$  and  $S_0$ ) were applied to the banana plants of cultivar grand nain for two trial years. Fertilizer and micronutrient treatment applied by the conventional methods to the test plants was served as control ( $M_5$ ). The height of pseudostem was measured after nine months of planting. It was measured from ground level to uppermost point of contacts of petioles of two young leaves with the help of measuring tape. The results were recorded. The pooled analysis and statistical analysis were worked out and the final results are present in table – 4, 4a and figure – 4.

It is clear from the results that the height of pseudostem was increased in all the plants under the water soluble fertilizer treatments  $M_1$ ,  $M_2$ ,  $M_3$  and  $M_4$  with micronutrients as compared to the height of pseudostem in controlled plants.

The pseudostem height was found to be more in plants under treatment  $M_2$  followed by  $M_4$  and  $M_1$ . The height was found to be very less in plants under treatment  $M_3$  followed by the controlled treatment  $M_5$  during both the trial years. The  $M_2$  treatment was found to be superior than the other treatments.

The growth in terms of Pseudostem height macronutrient and micronutrient content of leaves during growing period of the test cultivar was greatly influenced by the application of water soluble fertilizers and micronutrients. The application of all the treatments was found to be stimulatory for the growth of the test cultivar. The  $M_2$  treatment was found to be the superior treatment than the other treatments. It was interesting to know that at 9<sup>th</sup> month of growth stage the test cultivar under  $M_2$  treatment showed more pseudostem height. During present studies increase in pseudostem height, might be due to increased rate of photosynthesis stimulated by the influence of fertigation at different levels. The drip fertigation might have tend to active absorption and utilization of plant nutrients. Similar findings were also reported by different workers on different parameters of growth in different plants such as Bhamkota et al. (1962), Srivastava (1964), Shrivastava (1969), Shrivastava (1970), Arora and Singh (1970), Agrawal et al. (1975), Awasthi et al. (1975), Agrawal et al. (1975), Singh and Rajput (1976), Turner and Barkus (1983), Supriya and Bhattacharya (1993), Das and Mohan (1993), Ghanta and Mitra (1993), Ghanta and Mitra (1993), Sharma and Bhattacharya (1994), Kumar et al. (1988), Subramanian and Pillai (1997), Durgadevi et al. (1997), Veena and lawania (1998), Afria et al. (1999), Kaniszewski et al. (1999) Silva and Uchida (2000), Ram and Bose (2000), Ram and Bose (2000), Lal et al. (2000), Ram and Bose (2000), Haque et al. (2000), Singaram and prabhu (2001), Singh et al. (2001), Memon et al (2001), Datta and Dhua (2002), Singh and Singh (2002), Babu and Singh (2002), Ibrikci and Buyuk (2002), Alila et al. (2004), Chauhan and Chandel (2008), Yadlod and Kadam

(2008), Kumar and Pandey (2008), Kumar et al (2008), Bhakare and Fatkal (2008), Moreira and Fajeria (2009), Kumar et al (2009), Khalid and Rashid (2009), Yadav et al. (2009), Shedeed et al. (2009), Ahmad et al (2010), Hazarika and Ansari (2010), Yadav et al. (2010), Yadav et al. (2010), Pathak et al. (2011), Modi et al (2012), Krishnasamy et al. (2012), Kumar et al (2012), Selim et al. (2012), Patil and shinde (2013), Krishnamurthy et al . (2013), Eida et al. (2013), Kapoor et al. (2014), Haneef et al. (2014), venkataramana et al. (2014), Kumar and Ahmad (2014), Marina et al. (2016), Belen et al. (2016), Chongtham et al. (2016) and Hussain et al. (2017).

**Table-1:** Studies on application of water soluble fertilizers and micronutrients in relation to pseudostem height during growing period of Grand Nain cultivar of Banana.

Treatments	Pseudostem height (cm) at harvest		
	I <sup>st</sup> year	II <sup>nd</sup> year	Pooled
<b>Main Plot treatments: Water soluble fertilizer treatments (M)</b>			
M <sub>1</sub>	1.99	1.94	1.96
M <sub>2</sub>	2.18	2.11	2.14
M <sub>3</sub>	1.95	1.89	1.92
M <sub>4</sub>	2.09	2.03	2.06
M <sub>5</sub>	1.68	1.63	1.65
S.Em. ±	0.04	0.04	0.03
CD@5%	0.13	0.12	0.08
<b>Sub Plot treatments: Micronutrient treatments (S)</b>			
S <sub>0</sub>	1.83	1.79	1.81
S <sub>1</sub>	2.12	2.05	2.08
S.Em. ±	0.03	0.02	0.02
CD@5%	0.08	0.07	0.05
<b>Interactions</b>			
<b>M×S</b>			
S.Em. ±	0.06	0.05	0.04
CD@5%	NS	NS	NS
<b>Y×M</b>			
S.Em. ±			0.04
CD@5%			NS
<b>Y×S</b>			
S.Em. ±			0.03
CD@5%			NS
<b>Y×M×S</b>			
S.Em. ±			0.06
CD@5%			NS
CV.	6.11	5.53	5.92
GM.	1.98	1.92	1.95

<b>Table: 1a</b> Significance and at par values of pseudostem height based on statistical analysis resulted by the treatments of water soluble fertilizers and micronutrients during growing periods of Banana cultivar Grand Nain								
<b>pseudostem height</b>								
<b>Year/ Pooled</b>	<b>Main Plot</b>					<b>Sub Plot</b>		<b>Interactions</b>
I Year	M <sub>2</sub>	M <sub>4</sub>	M <sub>1</sub>	M <sub>3</sub>	M <sub>5</sub>	S <sub>1</sub>	S <sub>0</sub>	NS
	2.18	2.09	1.99	1.95	1.68	2.12	1.83	
II Year	M <sub>2</sub>	M <sub>4</sub>	M <sub>1</sub>	M <sub>3</sub>	M <sub>5</sub>	S <sub>1</sub>	S <sub>0</sub>	NS
	2.11	2.03	1.94	1.89	1.63	2.05	1.79	
Pooled	M <sub>2</sub>	M <sub>4</sub>	M <sub>1</sub>	M <sub>3</sub>	M <sub>5</sub>	S <sub>1</sub>	S <sub>0</sub>	NS
	2.14	2.06	1.96	1.92	1.65	2.08	1.81	

## REFERENCES

- Afria B.S., Pareek C.S., Garg D.K. and K. Singh (1999):** Effect of foliar spray of micronutrients and their combinations on yield of Pomegranate. *Ann. Arid Zone* **38(2)**:189-190.
- Aggarwal R.K., Panday S.K.N. and O.P. Pareek (1975):** Foliar application of micronutrients on Thompson seedless grape. *Ann. Arid Zone* **14(2)**:191-193.
- Arora J.S. and J.R. Singh (1970):** Some effects of iron spray on growth, yield and quality of guava fruits (*Psidium guajava* L.). *J. Japan Soc. Hort. Sci.* **39 (2)**: 139-142.
- Awasthi R.P., Tripathi B.R. and A. Singh (1975):** Effect of foliar sprays of zinc on fruit drop and quality of litchi. *Punjab Hortic.J.* **15**:14-16.
- Belen M.A., Mary R.M.C., Almudena B., Francisco L. and Q. Ana (2016):** Liquid organic fertilizers for sustainable agriculture: Nutrient uptake of organic versus mineral fertilizers in citrus trees. *J. Pon.* **11(10)**: e0161619.
- Bhambota J.R., Azad K.C., Kanwar J.S. and D.R. Dhingra (1962):** Study of the effect of sprays with micronutrients of the chorosis of citrus. *Hortic. Adv.* **6**:168-172.
- Chongtham S.K., Patel C.K., Patel R.N., Patel J.K., Patel J.M., Zapadiya D.M., Patel D.H., H. and C.R. Patel (2016):** Growth, yield, economics, water and nutrient use efficiency of potato as influenced by different methods of drip fertigation and varieties. *Int. J Agric. Sci.*, **8(38)**:1787-1790.
- Das D. K.(2003):** Micronutrients: their behaviour in soils and plants. Kalyani Publications., Ludhiana, pp.1-2.
- Das P.K., and N.K. Mohan (1993):** Effect of micronutrient of growth nad development of banana cvs. Chenichampa, Jahafi and Barjahafi. *South Indian Hortic.* **41(4)**:192-197.

**Durgadevi D., Srinivasan P.S., and K .Balakrishna (1997):** Leaf nutrient composition, chlorosis and yield of Sathgudi orange as affected by micronutrient applications. *South Indian Hortic.* **45(1-2):**16-29.

**Eiada A.O. and E.A.A.H. Mustafa (2013):** Effect of Foliar Application with Manganese and Zinc on Pomegranate Growth, Yield and Fruit Quality. *J. Hort. Sci. & Ornamental Plants*,**5(1):**41-45.

**Ghanta P.K., and S.K. Mitra (1993):** Effect of micronutrients on Growth, flowering, leaf nutrient content and yield of banana cv. Giant Governor. *Crop Res.* **6(2):**284-287.

**Haneef M., Kaushik R.A., Sarolia D.K., Mordia A. and M. Dhakar (2014):** Irrigation scheduling and fertigation in pomegranate cv. Bhagwa under high density planting system. *Indian J. Hort.* **71(1):** 45-48.

**Hussain F.S., Reddy L. and V. Ramudu (2017):** Growth and leaf nutrient status in banana cv. Grand Nain (AAA) as influenced by different organic amendments. *Int. Curr. Microbial. App. Sci.* **6(12):** 2340-2345.

**Kanisewski S, Rumpel J. and J. Dysko (1999):** Effect of drip irrigation and fertigation on growth and yield of celeriac (*Apium graveolens* L.var. *rapaceum* (Mill.) Gaud). *Veg Crops Res Bulletin.* **50:**31-39.

**Kapoor R., Sanadal S.K., Sharma K., Kumar S. and Saroch. (2014):** Effect of varying drip irrigation levels and NPK fertigation on soil water dynamics, productivity and water use efficiency of cauliflower (*Brassica oleracea* var. *Botrytis*) in wet temperate zone of Himachal Pradesh. *Indian J Soil Cons.*, **42:**249-254.

**Krishnamurthy D., Bhaskar S. and H.S. Shivaramu (2013):** influence of distillery spentwash ferti-irrigation on productivity, economics and nutrient uptake in banana (*Musa paradisiaca*). *Indian J.Agro.* **58 (2):** 251-255.

**Krishnasamy S., Mahendran P.P., Gurusamy A. and R. Babu (2012):** Effect of subsurface drip fertigation on growth and yield of banana. *Madras Agric. J.* **99(10-12):**803-806.

**Kumar D. and N. Ahmed (2014):** Response of nitrogen and potassium fertigation to waris almond (*Prunus dulcis*) under north western himalayan region of India. *Sci. Wor. J.* <http://dx.doi.org/10.1155/2014/14148>.

**Kumar D., Pandey V. and V. Nath (2012):** growth yield and quality of vegetable banana Monthan (Banthal-AAB) in relation to NPK fertigation. *Indian J. Hort.* **69(4):** 467-471.

**Kumar P. (2002):** Managing micronutrient deficiency in ornamental crops. *Indian Hort.*, **46(4):** 30-31.

**Kumar R., Chauhan K.S., and S. Sharma (1988):** A note on the effect of zinc sulphate on berry set, panicle drying and quality of grapes cv. Gold. *Haryana J. Hortic. Sci.* **17(3-4):**213-215.

**Marina T. S., Olga N. and S. Monika (2016):** The effect of foliar fertilizing on the chemical composition of leaves of Primorski almond cultivar grown in Valandovo. *Int. J. Rec. Sci. Res.* **7(4):** 10247-10250.

**Modi P.K., Varma L.R., Bhalerao P.P., Verma P. and A. Khade (2012):** Micronutrient spray on growth, yield and quality of papaya (*Carica papaya* L.) cv. Madhu Bindu. *Madras Agri.J.*, **99(7-9):**500-502.

**Patil V.K. and B.N. Shinde (2013):** studies on integrated nutrient management on growth and yield of banana cv. Ardhapuri (*Musa AAA*). *J. Hort. For.* **5(9):** 130-138.

- Ram R.A. and T.K. Bose (2000):** Effect of foliar application of magnesium and micronutrients on growth, yield and fruit quality of mandarin orange (*Citrus reticulata* Blanco). *Indian Journal of Horticulture*, **57(3)**:215-220.
- Ranganna S. (1980):** Manual of analysis of fruits and vegetable. Tata Mc Graw Hill Pub. Co. Ltd., New Delhi.
- Selim E. and A.A. Mosa (2012):** Fertigation of humic substances improves yield and quality of broccoli and nutrient retention in a sandy soil. *Journal of Plant Nutrition and Soil Science*. **175(2)**:273-281.
- Shrivastava S.S. (1969):** Effect of foliar application of zinc on growth, fruiting behaviours and quality of pineapple. *Indian J. Hortic.* **26(1-2)**:146-150.
- Shrivastava S.S. (1970):** Foliar application of boron on Pineapple: Its Effect of growth, yield and fruit quality. *Madras Agric. J. Sci.***57**:146-151.
- Silva J. A. and R. Uchida (2000):** Essential nutrients for plant growth: nutrient functions and deficiency symptoms. Plant nutrient management in hawaii's soils, approaches in tropical and subtropical agriculture. Pp: 31-55.
- Singh R.R. and C.B.S. Rajput (1976):** Effect of various concentrations of zinc on vegetative growth characters, flowering, fruiting and physicochemical composition of fruits in mango cv. Chausa, *Haryana J.Hortic. Sci.***5(1-2)**:10-14.
- Subramanian V. and Pillai A.A. (1997):** Studies on the zinc deficiency in banana growing soils of Tamil Nadu. *Indian J. Agric. Res.* **31(3)**:105-188.
- Supriya L. and R.K. Bhattacharyya (1993):** Effect of foliar application of chelated and non-chelated zinc on growth and yield of Assam lemon. *Hortic.J.***6(1)**35-38.
- Turner D.W. and B. Barkus (1983):** The uptake and distribution of nutrients in the banana in response to supply of K, Mg and Mn. *Fert. Res.***4**: 89-99.
- Venkataramana K.T., Mukundalakshmi L., Gopal K., Sivaramakrishna V.N.P., Nagalakshmi T., Sarada G., Gopi V. and T. Gourishankar (2014):** Nitrogen and potassium based fertigation response on plant growth, yield and quality of sweet orange (*Citrus sinensis* Linn. Osbeck) cv. Sathgudi. *Res. rev. J. Agric. All. Sci.* **3(3)**: 7-10.