



A Study of Water Soluble Fertilizers and Micronutrients on Potassium content of leaves during growing periods of Banana (CV. Grand Nain)

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ABSTRACT

During the present studies Different water soluble treatments with and without micronutrients treatments were applied to the banana plants of cv. 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 Phosphorous content of leaf of the test cultivar of Banana was studied by wet digestion, diacid mixture, as described by Jackson (1973). The results were recorded accordingly, pooled analysis and the statistical analysis were worked out. From the results it is evident that the leaves of the test banana plants under all the fertilizer treatments showed increased percentage of potassium (K_2O) after three, six and nine months of planting during first year and second year as compared to the controlled fertilizer treatment M_5 . It was noted that the potassium (K_2O) content of leaf found to be increased with the increasing in growth period during both the trial years. It is evident from the results that the leaves of banana plant after six months of planting under M_2 treatment found to be contain more potassium (K_2O) i.e., 3.32% and least under M_3 treatment found to be contain less potassium (K_2O) i.e., 3.20% as compared to M_1 and M_4 .

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 man's 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 varieties 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 A Study of Water Soluble Fertilizers and Micronutrients on Potassium content of leaves during growing periods of Banana (CV. Grand Nain)

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 leaf sample selection was taken from petiole of third open leaf from apex. The potassium content of leaf of the test cultivar Banana was studied by wet digestion, diacid mixture, 4 : 1 (HClO₄ : H₂SO₄), flame photometer method as described by Jackson (1973).

Treatment Details

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

Details of application schedule of fertilizers

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

Total number of plants	640
Total number of treatments	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

The potassium (K_2O) content of leaf of the test banana plant was estimated by wet digestion diacid mixture method as described by Jackson (1973). The results are recorded pooled analysis and statistical analysis was worked out and the results are presented in table - 1 and figure 1. From the results presented in table - 1 and 1a it is clear that the leaves of the test banana plants under water soluble Banana treatments showed increased percentage of potassium (K_2O) after three, six and nine months of planting during first year and second year as compared to the controlled fertilizer treatment M_5 . It was interesting to note that the potassium (K_2O) content of leaf found to be increased with the increasing in growth period during both the trial years. It is also clear from the results that the leaves of banana plant after six months of planting under M_2 treatment found to be contain more potassium (K_2O) i.e., 3.32% and least under M_3 treatment found to be contain less potassium (K_2O) i.e., 3.20% as compared to M_1 and M_4 .

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

Leaf K_2O									
Treatments	3 rd MAP			6 th MAP			9 th MAP		
	I st year	II nd year	Pooled	I st year	II nd year	Pooled	I st year	II nd year	Pooled
Main Plot treatments: Water soluble fertilizer treatments (M)									
M_1	3.07	3.17	3.12	3.22	3.25	3.23	2.77	3.00	2.88
M_2	3.16	3.27	3.21	3.31	3.34	3.32	2.95	3.07	3.01
M_3	3.04	3.15	3.10	3.19	3.22	3.20	2.78	2.95	2.86
M_4	3.09	3.20	3.15	3.24	3.25	3.24	2.80	3.00	2.90
M_5	2.99	3.10	3.05	3.16	3.22	3.19	2.72	2.96	2.84
S.Em. \pm	0.03	0.01	0.01	0.03	0.03	0.01	0.03	0.02	0.01
CD@5%	0.10	0.03	0.04	0.09	0.08	0.04	0.11	0.07	0.04
Sub Plot treatments: Micronutrient treatments (S)									
S_0	3.04	3.15	3.09	3.17	3.23	3.21	2.77	2.96	2.86
S_1	3.10	3.21	3.15	3.27	3.28	3.27	2.84	3.03	2.94
S.Em. \pm	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01

CD@5%	0.03	0.04	0.03	0.06	0.02	0.03	0.02	0.02	0.03
Interactions									
M×S									
S.Em. ±	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
CD@5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
Y×M									
S.Em. ±			0.02			0.02			0.02
CD@5%			NS			NS			0.06
Y× S									
S.Em. ±			0.01			0.01			0.01
CD@5%			NS			NS			NS
Y×M×S									
S.Em. ±			0.03			0.03			0.03
CD@5%			NS			NS			NS
CV.	6.14	4.84	5.64	5.82	5.58	5.72	6.34	5.57	6.02
GM.	3.07	3.18	3.12	3.22	3.25	3.24	2.80	3.00	2.90

MAP-months after planting

Table-1a: Significance and at par values of Potassium (K) content of leaves based on statistical analysis resulted by the treatments of water soluble fertilizers and micronutrients during growing periods of Banana cultivar Grand Nain

Leaf Potassium content									
Month	Year/ Pooled	Main Plot					Sub Plot		Interactions
3	I Year	M ₂	M ₄	M ₁	M ₃	M ₅	S ₁	S ₀	NS
		3.16	3.09	3.07	3.04	2.99	3.10	3.04	
	II Year	M ₂	M ₄	M ₁	M ₃	M ₅	S ₁	S ₀	NS
		3.27	3.20	3.17	3.15	3.10	3.21	3.15	
	Pooled	M ₂	M ₄	M ₁	M ₃	M ₅	S ₁	S ₀	NS
		3.21	3.15	3.12	3.10	3.05	3.15	3.09	
6	I Year	M ₂	M ₄	M ₁	M ₃	M ₅	S ₁	S ₀	NS

		3.31	3.24	3.22	3.19	3.16	3.27	3.17	
	II Year	M ₂	M ₄	M ₁	M ₃	M ₅	S ₁	S ₀	NS
		3.34	3.25	3.25	3.22	3.22	3.28	3.23	
	Pooled	M ₂	M ₄	M ₁	M ₃	M ₅	S ₁	S ₀	NS
		3.32	3.24	3.23	3.20	3.19	3.27	3.21	
9	I Year	M ₂	M ₄	M ₁	M ₃	M ₅	S ₁	S ₀	NS
		2.95	2.80	2.77	2.78	2.72	2.84	2.77	
	II Year	M ₂	M ₄	M ₁	M ₅	M ₃	S ₁	S ₀	NS
		3.07	3.00	3.00	2.96	2.95	3.03	2.96	
	Pooled	M ₂	M ₄	M ₁	M ₃	M ₅	S ₁	S ₀	NS
		3.01	2.90	2.88	2.86	2.84	2.94	2.86	

Indicates values at a par with each other

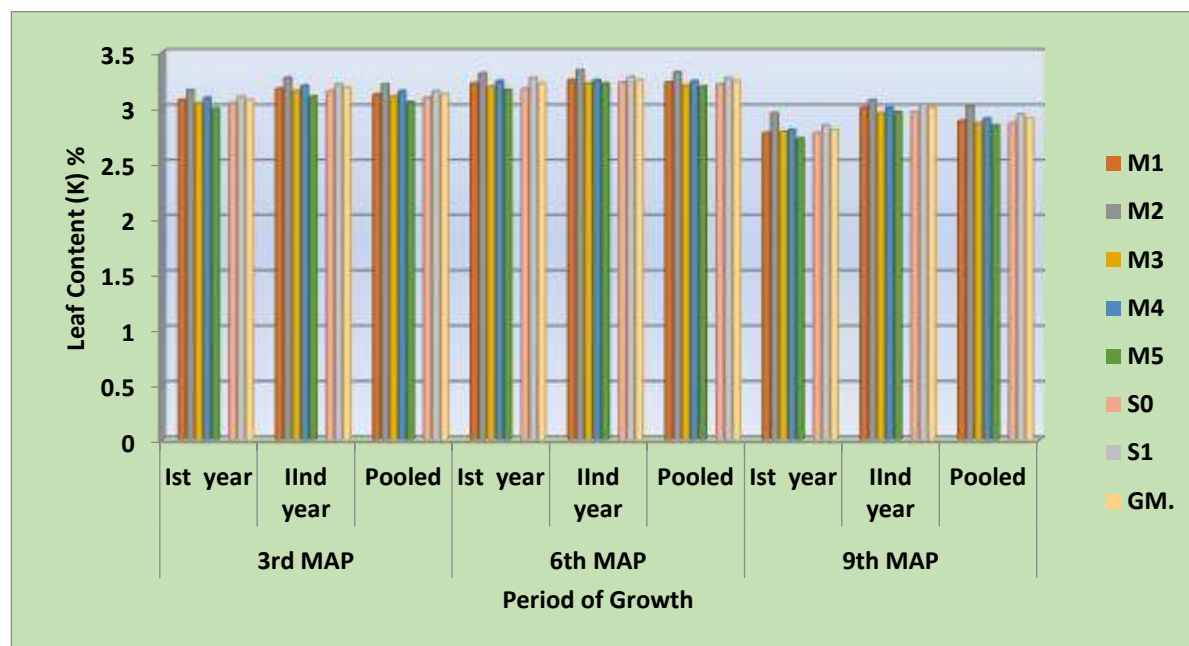


Figure-1: Studies on application of water soluble fertilizers and micronutrients in relation to Potassium (K) content of leaves during growing period of Ground Nain cultivar of Banana.

Discussion:

The M₂ treatment was found to be the superior treatment than the other treatments. The potassium content of leaf of the test cultivar under M₂ treatment of fertilizers at 6th month of growth stage was found to be more as compared to the other treatments. During present studies increase in potassium 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.

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 Horticulture***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 chlorosis 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 and 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.
- Jackson M. L. (1973):** "Soil Chemical Analysis". Prentice-Hall of India Pvt. Ltd., New Delhi, India, pp: 39-415.
- 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 alomond (*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. Hort.* **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. Hort. 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.

