JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

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

Dr. 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 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 resultsit is evident that the leaves of the test banana plants under all the fertilizer treatments showed increase in phosphorous (P_2O_5) content as compared to the control during both the trial years after three, six and nine months of planting. The leaves of plants under M_2 treatment showed more percentage of phosphorous (P_2O_5) which is followed by the leaves of plants under treatment M_4, M_3 and M_1 after six months of planting during both the trial years. Whereas the leaves of plants of nine months old under M_3 treatment showed low percentage of phosphorous (P_2O_5) during the two trial years. It was interesting to note that the M_2 treatment of fertilizers found to be superior for the increase of phosphorous (P_2O_5) content of leaf of the test banana cultivar grand nain.

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

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 Phosphorous content of leaf of the test cultivar of Banana was studied by wet digestion, diacid

mixture, 4:1 ($HClO_4$: $H2SO_4$) vanodomolybolate phosphoric acid yellow colour 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/treatment	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 Potasssium
SSP=Single Super Phosphate
MOP=Murate of potash

Results

The phosphorous (P_2O_5) content of leaf of the test cultivar of banana was determined by vanadomolybdate phosphoric acid method as described by Jackson (1973). The results with pooled analysis are presented in table.

From the results presented in table and it is evident that the leaves of the test banana plants under all the fertilizer treatments showed increase in phosphorous (P_2O_5) content as compared to the control during both the trial years after three, six and nine months of planting. The leaves of plants under M_2 treatment showed more percentage of phosphorous (P_2O_5) i.e., 0.29% which is followed by the leaves of plants under treatment

M_4, M_3 and M_1 after six months of planting during both the trial years. Whereas the leaves of plants of nine months old under M_3 treatment showed low percentage of phosphorous (P_2O_5) i.e., 0.146% and 0.149% during the two trial years. It was interesting to note that the M_2 treatment of fertilizers found to be superior for the increase of phosphorous (P_2O_5) content of leaf of the test banana cultivar grand nain.

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

Leaf P_2O_5									
Trea ,,,,,,,,,,,,,,,,,,,,,,,,,tments	3rd MAP			6th MAP			9th MAP		
	Ist year	IInd year	Pooled	Ist year	IInd year	Pooled	Ist year	IInd year	Pooled
Main Plot treatments: Water soluble fertilizer treatments (M)									
M_1	0.214	0.216	0.215	0.263	0.267	0.265	0.162	0.165	0.163
M_2	0.240	0.242	0.241	0.289	0.296	0.293	0.191	0.193	0.192
M_3	0.201	0.203	0.202	0.250	0.252	0.251	0.146	0.149	0.148
M_4	0.219	0.221	0.220	0.269	0.272	0.270	0.167	0.168	0.167
M_5	0.185	0.188	0.187	0.235	0.236	0.236	0.132	0.134	0.133
S.Em. ±	0.002	0.002	0.001	0.002	0.004	0.002	0.004	0.003	0.002
CD@5%	0.008	0.007	0.004	0.008	0.011	0.005	0.012	0.010	0.006
Sub Plot treatments: Micronutrient treatments (S)									
S_0	0.207	0.209	0.208	0.256	0.259	0.258	0.154	0.156	0.155
S_1	0.217	0.219	0.218	0.266	0.270	0.268	0.165	0.167	0.166
S.Em. ±	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.001
CD@5%	0.003	0.002	0.002	0.003	0.005	0.003	0.005	0.005	0.004
Interactions									
M×S									
S.Em. ±	0.003	0.002	0.002	0.003	0.004	0.003	0.004	0.004	0.003
CD@5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
Y×M									
S.Em. ±			0.002			0.003			0.003
CD@5%			NS			NS			NS
Y× S									
S.Em. ±			0.001			0.002			0.002
CD@5%			NS			NS			NS
Y×M×S									
S.Em. ±			0.003			0.004			0.004
CD@5%			NS			NS			NS
CV.	5.83	5.34	5.59	4.30	4.39	4.83	5.82	5.31	5.53
GM.	**0.212**	**0.214**	**0.213**	**0.261**	**0.265**	**0.263**	**0.159**	**0.162**	**0.161**

MAP-months after planting

gnificance and at par values of Phosphorous (P) 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 Phosphorous 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
		0.240	0.219	0.214	0.201	0.185	0.217	0.207	
	II Year	M_2	M_4	M_1	M_3	M_5	S_1	S_0	NS
		0.242	0.221	0.216	0.203	0.188	0.219	0.209	
	Pooled	M_2	M_4	M_1	M_3	M_5	S_1	S_0	NS
		0.241	0.220	0.215	0.202	0.187	0.218	0.208	
6	I Year	M_2	M_4	M_1	M_3	M_5	S_1	S_0	NS
		0.289	0.279	0.263	0.250	0.235	0.266	0.256	
	II Year	M_2	M_4	M_1	M_3	M_5	S_1	S_0	NS
		0.296	0.272	0.267	0.252	0.236	0.270	0.259	
	Pooled	M_2	M_4	M_1	M_3	M_5	S_1	S_0	NS
		0.293	0.270	0.265	0.251	0.236	0.268	0.258	
9	I Year	M_2	M_4	M_1	M_3	M_5	S_1	S_0	NS
		0.191	0.167	0.162	0.146	0.132	0.165	0.154	
	II Year	M_2	M_4	M_1	M_3	M_5	S_1	S_0	NS
		0.193	0.168	0.165	0.149	0.134	0.167	0.156	
	Pooled	M_2	M_4	M_1	M_3	M_5	S_1	S_0	NS
		0.192	0.167	0.163	0.148	0.133	0.166	0.155	

Indicates values at a par with each other

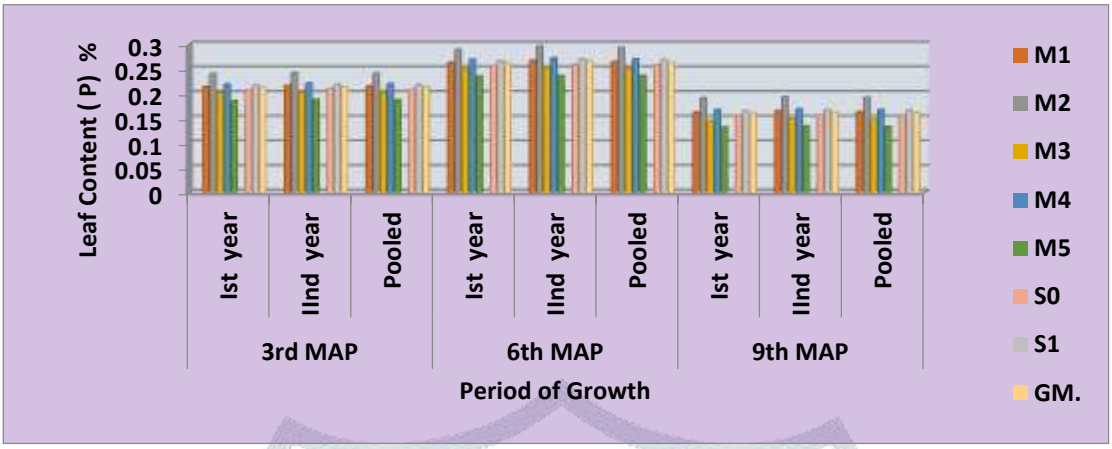

Figure-1: Studies on application of water soluble fertilizers and micronutrients in relation of Phosphorous (P) content of leaves during growing period of Grand Nain cultivar of Banana.

Discussion:

The M_2 treatment was found to be the superior treatment than the other treatments.The phosphorous of leaves was found to be increased during both the trial years at three, six and nine month growth stage of the test cultivar under the M_2 treatment of fertilizers. The increase 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 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 effeciency 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 behavaiour 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 IndainHortic*.**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 spentwashferti-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 warisalomond (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 not 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.