Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-6: 112-119

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-6 pp. 112-119**
Journal homepage: http://www.ijcmas.com

Original Research Article

Studies on Macro and Micro Nutrient Status in Leaf Tissue of Pomegranate (*Punica Granatum*) Orchads of Latur District

P.B. Kolekar[1] and Gajbhiye Bhagyaresha[2*]

[1]Department of Soil Science and Agriculture Chemistry, College of Agriculture, Latur, M.S., India
[2]Vasantrao Naik Marathawada Krishi Vidyapeeth, Parbhani 431402 (M.S.), India
**Corresponding author*

A B S T R A C T

The present investigation entitled "Studies on macro and micro nutrient status in leaf tissue of pomegranate (*Punica granatum*) orchards of Latur district" was carried on 2014-2015. For this purpose leaf sampling was done from the twigs of current season growth at 8th leaf from the apex in April 2015 with 50 leaves sample. The results indicated that leaf N, P and K concentration of pomegranate orchards were varied from 1.61 to 3.40, 0.05 to 1.80 and 1061 to 9.91 per cent with average values of 2.28, 0.30 and 4.90 percent, respectively. It showed high content of nitrogen and potassium and low phosphorus concentration in pomegranate leaves. The leaf Fe, Mn, Zn and Cu concentration of pomegranate orchards varied from 152 to 283, 50.4 to 86.1, 6.21 to 24.81 and 7.43 to 36.32 mg kg^{-1} with mean values of 210.68, 69.31, 14.30 and 18.50 mg kg^{-1}, respectively. The boron concentration in leaf was ranged from 7.05 to 51.60 per cent with an average value of 21.74 mg kg^{-1}. It showed Zn and Cu deficiency, respectively. However, leaf Fe and Mn were found to be sufficient in pomegranate leaves. The boron deficiency in pomegranate leaf was to a tune of 72 per cent. The leaf nitrogen and potassium were found in sufficient limit while, phosphors was deficient in pomegranate leaf. The leaf micronutrient *viz.*, zinc, copper and boron were found to be deficient in leaves even as, leaf iron and manganese were sufficient in pomegranate leaves.

Keywords

Macronutrients, Micronutrients, Pomegranate, Leaf tissue

Introduction

Pomegranate (*Punica granatum* L.) belongs to family Punicaceae is grown in tropical and sub-tropical regions of the world. The fruit is native of Iran and is extensively cultivated in the Mediterranean countries like Spain, Morocco, Egypt, Iran and Afghanistan. It is also grown to some extent in Burma, China, Japan, U.S.A. (California) USSR, and India. The edible part of pomegranate fruit is the juicy outgrowth of the seed, called aril. The parts of the fruit are a good source of sugars (14-16%), minerals (0.7-1.0%) and a fair source of Iron (0.3-0.7mg/100g.) and also contains considerable amount of acids, vitamins, polysaccharides, polyphenols and important minerals. India ranks first in the world with respect to pomegranate area and production. Pomegranate is concentrated in 4-5 districts such as Solapur, Nasik, Sangli, Ahmednagar, Latur and Beed. Maximum area of pomegranate is occupied by Ganesh approximate 90 percent and other important varieties include Mrudula, Bhagava and

Arkata. In Latur district maximum area is under Bhagava. Latur district is the south western part of Marathwada region of Maharashtra state. Annual rainfall is 741-840 mm. Maximum and minimum temperature of this district is 43.3 ^{0}C and 11.9 ^{0}C, respectively. The elevation is 600-750 m, from MSL and which comes under central Maharashtra plateau and semi-arid region. The soil in Latur district is shallow soil generally underlined by murrum layer. Murrum layer developed from Deccan basalt is found to be rich in smectite mineral. Smectite is the important clay mineral for availability of nutrients in soil. In Latur district pomegranate is grown on different soil types *viz*. very deep soil, moderately deep soil, shallow and very shallow soil. In order to increase the area under production of pomegranate it is necessary to take up the intensive study of soil to ascertain soil parameter responsible for influencing productivity. For increasing the productivity and quality of fruit, it should have suitable for soil quality and environment and it is of prime importance to characterize and evaluate the soil site characteristics.

Materials and Methods

In order to know the leaf nutrient status, fifty pomegranate orchards located in different tahsils of the Latur district was randomly selected and soil samples were collected in December 2014.The leaf sampling was done from the twigs of current season growth at 8th leaf from the apex in April 2015 with sample size at 50 leaves (Bhargava and Dhandar, 1987). The collected leaf samples were brought to the laboratory. The samples were air dried on perfectly clean surface at room temperature for 2-3 days in dust free atmosphere free from any kind of contaminants. Samples were placed in oven at 60^{0}C for 48 hrs and grinded in an electric stainless steel mill using 0.5 mm sieve. Then the samples were placed in oven to dry for few hours more till constant weight and stored in well stopper plastic jars for analysis. The standard methods were followed for determination of total nutrients in leaves. Total nitrogen in the leaf sample was determined by modified Kjeldahl's method by using kelplus digestion and distillation unit (Piper, 1966). Total phosphorus was spectro photometrically by vanadomolybdate phosphoric acid yellow color method from diacid extract described by Jackson (1967). Total potassium content was determined by using flame photometer (Jackson, 1967). Fe, Zn, Mn and Cu was estimated by standard procedure (Piper, 1966) these four metals were determined in the di-acid digest of plant tissues using Atomic Absorption Spectrophotometer. Boron was determined in di-acid digest of plant tissue using Azomethine- H by calorimetric method (Jackson, 1967 and Piper, 1966).

Results and Discussion

Macronutrient status of leaves

The data regarding leaf analysis of different pomegranate orchards for macronutrient status is presented in table 1.

Total nitrogen

Total nitrogen content of pomegranate leaves was varied from 1.61 to 3.40 per cent with an average of 2.28 per cent. The lowest amount of total nitrogen (1.61 %) was recorded in orchard leaves collected from Chakur village whereas, the highest amount (3.40 %) was recorded in orchard leaves collected from Nalegaon village. Among 50 orchards, only 1 orchard (2 per cent) was medium in total nitrogen content while, 49 orchards (98 per cent) were showed high total nitrogen status. These results confirm

the findings reported by Raghupati and Bhargava (1998) noted that N content were ranged from 0.40 to 2.20 per cent. Ghatala *et al.,* (2004) also studied the nutrient concentration in pomegranate orchards of Jaipur district, Rajasthan and reported that nitrogen concentration in leaves ranged from 0.65 2.35 per cent. Similarly, Heposky *et al.,* (1998) found that N contents were ranged from 0.71 to 1.57 in pomegranate orchard leaves.

Total phosphorus

Total phosphorus content of pomegranate leaves was ranged from 0.05 to 1.80 per cent with an average of 0.30 per cent. The less amount of total P (0.05 %) was noted in orchard leaves collected from Budhda and Ashta village. However, the high amount of total P (1.80 %) was recorded in orchard leaves collected from Nagarsoga village. Out of 50 orchards, 23 orchards (46 %) were categorized as low, 13 orchards (26 %) medium and 14 orchards (28 %) were categorized as high in total phosphorus content in pomegranate leaves. These results are in agreement with the findings of Raghupati and Bhargava (1998) and Ghatala *et al.,* (2004). Singh and Kumar (2012) found that P contents were ranged from 0.184 to 0.276 per cent.

Total potassium

Total potassium content of pomegranate leaves varied from 1.61 to 9.91per cent with a mean value 4.90 per cent. The minimum content of total K (1.61 %) was recorded in orchard leaves collected from Murud village. Whereas, maximum content (9.91 %) was recorded in orchard leaves collected from Ausa village. All 50 orchards (100%) of pomegranate were rich in total potassium. These results are in resemblance with the findings of Raghupati and Bhargava (1998). Leaf analysis is the diagnostic nutrient technique in pomegranate orchards soil that supplied adequate potassium which was also reflected in leaf nutrient content. Parwe (2013) found that K contents were ranged from 1.02 to 9.71 per cent. Gimienez *et al.,* (2000) found that two verities of pomegranate i.e. local mollar and Israeli verities and observed that K varied from 0.55 to 0.69 per cent while, 0.90 to 1.00 per cent, respectively in leaves of pomegranate orchard.

Micronutrient status of leaves

The data regarding leaf analysis of different pomegranate orchards for micronutrient status is presented in table 2.

Total iron

The total iron content of leaves from different pomegranate orchards varied from 152 to 283mg kg^{-1} with an average value of 210.68mg kg^{-1}.

The lowest total Fe content (152 mg kg^{-1}) was observed in orchard leaves collected from Atola village. Whereas, the highest total Fe content (283 mg kg^{-1}) was recorded in orchard leaves collected from Shivali village. Further, it was noticed that out of 50 orchards, 31 orchards (62%) were categorized as medium and 19 orchards (38%) were high in leaf iron. these results are similar with findings of Parwe (2013) observed the range of iron in leaves was 124.0 to 3.10.0 mg kg^{-1} in pomegranate orchards of Beed district. Similarly, Roman (2015) also observed the range of total iron in leaves was 168.0 to 293.0 mg kg^{-1} in pomegranate orchards of Latur district, Raghupati and Bhargava (1998) reported that Fe contents were varied from 25 to 297 in leaves of pomegranate orchards of Karnataka.

Total manganese

The total manganese content in leaves of pomegranate varied from 50.4 to 86.1mg kg^{-1} with an average value of 69.31mg kg^{-1}. The minimum content of total Mn (50.4 mg kg^{-1}) was recorded in orchard leaves. However, highest content of Mn (86.1 mg kg^{-1}) was noted in orchard leaves both the leaves sample are collected from Ashta village.

These findings are on parallel line with the results obtained in the present investigation. It is evident from table 2, 50 orchards (100 per cent) categorized as medium in manganese content. These results are similar with findings of Roman (2015) he also observed the range of total Mn in leaf was 55.2 to 87.1 mg kg^{-1} respectively in pomegranate orchards of Latur district. Raghupati and Bhargava (1998) reported that Mn contents were ranged from 14 to 99 mg kg^{-1} in leaves of pomegranate orchards of Karnataka.

Total zinc

Total zinc content in leaves ranged from 6.21 to 24.81 mg kg^{-1} with a mean value of 14.30mg kg^{-1}. The less amount of total Zn (6.21 mg kg^{-1}) was noted in orchard leaves collected from Atola village. However, the high amount of total Zn (24.81 mg kg^{-1}) was noted in orchard leaves collected from Shivli village. These findings are on parallel line with the results obtained in the present investigation. Among, 50 orchards, 19 orchards (38 %) low, 31 orchards (62 %) were medium in zinc content. These results are similar with findings of Parwe (2013) found that Zn in soil was 50.0 to 90.2 mg kg^{-1} in pomegranate orchards of Beed district. Mamgain *et al*., (1998) reported that Zn contents were ranged from 20.1 to 23.4 ppm in leaves of apple orchards from Rajgarh area of Himachal Pradesh.

Total copper

Total amount of copper content in leaves varied from 7.43 to 36.32mg kg^{-1} with an average value of 18.50mg kg^{-1}. The lowest value (7.43 mg kg^{-1}) was observed in orchard leaves collected from Ashtamvad village while, the highest value (36.32 mg kg^{-1}) was recorded in orchard leaves collected from Ashta village.

Out of 50 selected pomegranate orchards, 42 (84 %) were low, while 8 orchards (16 %) were rated as medium in copper content. These findings are in accordance with findings of Parwe (2013) and Roman (2015) Gathala *et al.,* (2004) showed that Cu contents were ranged from 0.6 to 22.0 mg kg^{-1} in leaves of pomegranate orchards in Jaipur district of Rajasthan.

Total boron

Total boron content of leaves varied from 7.05-51.60mg kg^{-1} with an average value of 21.74mg kg^{-1}. The lowest value (7.05 mg kg^{-1}) of boron content was observed in orchard leaves collected from Chakur village whereas, highest value (51.60 mg kg^{-1}) was recorded in orchard leaves collected from Karla village.72 per cent pomegranate orchards were low 24 per cent were medium in boron content and only 4 per cent orchards high in boron concentration.

These findings are in confirmatory with the findings of Parwe (2013) also observed the range of Boron in soil was 5.21 to 60.40 mg kg^{-1} in pomegranate orchards of Beed district. Roman (2015) observed the range of available Boron in leaf was 1.20 to 3.80 mg kg^{-1} respectively in pomegranate orchards of Latur district. Gathala *et al.,* (2004) showed that B contents were ranged from 19.02 to 32.0 mg kg^{-1} in leaves of pomegranate orchards in Jaipur district of Rajasthan.

Table.1 Macronutrient status in leaves of pomegranate orchards of Latur district

Sr.No.	**Village**	**Total N (%)**	**Total P (%)**	**Total K (%)**
1	Darjiborgaon	2.05	0.10	4.25
2	-do-	1.89	0.11	3.11
3	-do-	1.81	1.12	1.79
4	Karkata	1.69	1.08	3.75
5	Murud	1.90	1.11	1.64
6	Gadhvad	2.09	1.13	3.40
7	-do-	2.61	0.15	6.76
8	Ashtamvad	2.75	0.09	7.65
9	-do-	1.85	0.10	3.56
10	Ashta	2.25	0.08	4.49
11	-do-	2.69	0.10	5.93
12	-do-	3.11	0.15	7.31
13	-do-	3.25	0.81	6.89
14	-do-	2.00	0.20	5.60
15	Nalegaon	2.44	0.13	8.00
16	Aatola	1.70	0.11	6.21
17	-do-	1.91	0.10	2.51
18	-do-	2.70	0.15	1.80
19	-do-	3.15	0.10	3.75
20	-do-	1.72	0.11	3.10
21	Nalegaon	2.39	0.21	6.25
22	-do-	3.40	1.25	2.70
23	Aatola	2.90	0.20	5.54
24	Chakur	1.91	0.23	6.85
25	-do-	1.61	0.29	4.90
26	Kutegaon	2.00	0.06	6.41
27	Budhada	1.98	0.05	7.27
28	Ausa	1.73	0.09	9.91
29	-do-	2.08	0.10	4.26
30	-do-	1.90	0.11	3.12
31	Nagarsoga	1.70	1.15	1.80
32	-do-	1.95	1.10	1.64
33	Samdarga	2.10	1.14	3.42
34	Korangala	2.60	0.15	6.76
35	Shivali	2.70	0.05	7.60
36	-do-	1.82	0.07	3.51
37	-do-	2.23	0.06	4.43
38	Ausa	2.46	0.05	5.33
39	Shivali	3.09	0.10	7.05
40	-do-	3.29	0.11	6.91
41	Karala	2.00	0.23	5.65
42	Hosur	2.45	0.15	8.05

43	Yerol	1.81	0.17	6.47
44	-do-	1.98	0.15	2.59
45	Kolkhed	2.67	0.15	1.79
46	-do-	1.79	0.11	3.15
47	-do-	2.35	0.09	6.20
48	Udgir	2.81	0.17	5.41
49	Savargaon	1.68	0.25	4.98
50	-do-	3.20	0.15	3.79
Range		7.0-8.4	1.61-3.40	0.05-1.80
Mean		7.75	2.28	0.30

Table.2 Micronutrient status in leaves of pomegranate orchards of Latur district

Sr.No.	**Village**	**Total Zn (mg kg^{-1})**	**Total Fe (mg kg^{-1})**	**Total Mn (mg kg^{-1})**	**Total Cu (mg kg^{-1})**	**Total B (mg kg^{-1})**
1	Darjiborgaon	18.42	248	72.5	21.90	19.08
2	-do-	19.10	162	68.8	23.45	14.90
3	-do-	13.92	167	70.2	14.02	31.42
4	Karkata	14.70	159	69.0	9.08	10.08
5	Murud	14.11	249	51.2	34.01	33.11
6	Gadhvad	10.09	185	68.2	21.80	31.43
7	-do-	12.01	280	72.4	7.48	14.22
8	Ashtamvad	13.11	279	74.9	7.43	15.80
9	-do-	13.71	175	68.0	8.17	7.09
10	Ashta	15.83	180	50.4	6.71	16.22
11	-do-	10.71	271	86.1	14.79	29.48
12	-do-	8.21	161	71.2	20.81	26.68
13	-do-	19.12	259	76.8	36.32	29.42
14	-do-	8.16	268	77.0	24.00	26.81
15	Nalegaon	6.48	181	73.2	29.27	18.62
16	Aatola	8.68	152	52.4	18.22	28.74
17	-do-	13.41	265	73.9	15.98	50.62
18	-do-	18.51	273	55.1	8.20	14.42
19	-do-	7.19	191	73.8	28.49	16.23
20	-do-	14.22	189	71.6	18.22	20.16
21	Nalegaon	20.39	175	64.2	18.29	33.48
22	-do-	23.83	271	65.2	24.42	21.18
23	Aatola	6.21	264	73.1	21.22	7.42
24	Chakur	13.49	181	65.4	29.24	19.18
25	-do-	19.12	161	79.22	9.22	7.05
26	Kutegaon	8.22	182	73.7	19.16	21.18
27	Budhada	17.15	168	63.12	21.46	9.17
28	Ausa	9.23	161	70.11	19.12	33.18
29	-do-	9.21	181	71.3	16.48	27.12
30	-do-	8.23	267	75.9	15.22	8.06

31	Nagarsoga	8.16	271	77.0	16.19	14.05
32	-do-	17.22	185	69.9	11.40	33.43
33	Samdarga	6.22	172	76.8	9.15	15.21
34	Korangala	22.11	268	56.4	22.13	16.80
35	Shivali	17.22	283	74.9	8.21	8.09
36	-do-	18.54	198	55.2	22.26	33.12
37	-do-	8.19	188	77.8	29.44	25.01
38	Ausa	15.20	176	72.6	18.12	34.48
39	Shivali	21.41	274	64.4	22.09	26.12
40	-do-	24.81	264	68.3	34.22	21.18
41	Karala	8.20	172	77.1	17.69	51.60
42	Hosur	14.83	170	68.1	9.17	15.41
43	Yerol	20.43	254	76.5	39.01	16.23
44	-do-	20.16	173	73.1	21.29	22.16
45	Kolkhed	11.10	195	70.1	22.81	28.46
46	-do-	13.10	230	69.18	8.12	24.18
47	-do-	12.43	211	74.7	8.19	7.23
48	Udgir	24.11	172	70.8	17.68	20.45
49	Savargaon	17.22	181	59.4	7.79	17.19
50	-do-	19.68	192	55.2	22.72	14.90
Range		7.0-8.4	6.21-24.81	152-283	50.4-86.1	7.43-36.32
Mean		7.75	14.30	210.68	69.31	18.60

Acknowledgement

The authors are grateful to Professor, College of Agriculture, Latur for providing financial assistance for conducting research work under Dept. of Soil Science and Agricultural Chemistry, during the study

References

Gathala, M. K., Yadav, B.V. and Singh, S. D. 2004. Mineral nutrient status of pomegranate orchards in Jaipur district of Rajasthan. *J. Indian Soc Soil Sci.*, 52(2): 206-208.

Gimenez, M., Martinez, J., Oltra, M. A., Martinez, J.J. and Ferranez, M. 2000. Pomegranate leaf analysis: correlation with harvest. Option Méditerranéennes: Series A, seminars 42. Pp 179-185.

Hepaksoy, S., Aksoy, U., Can, H. Z. and Ui, M. A. 1998. Determination of relationship between fruit cracking and some physiological responses, leaf characteristics and nutritional status of some pomegranate varieties. CIHEAM-*Option Méditerranéennes. EgeAgril, Uni turkey.* Pp87-92.

Jackson, M. L. 1967. Soil chemical analysis, Prentice hall of India Pvt. Ltd., New Delhi, pp-205.

Kaith, N. S. and Awasti, R. P. 1998. Effect of K on growth, yield, fruit quality and leaf nutrient status of apple starking delicious. *Indian J. Horti*., 55(1):10-15.

Mamgain, S., Verma, H. S. and Kumar, J. 1998. Relationship between fruit yield and foliar and soil nutrient status in apple. *Indian J. Hort*., 55(3) 226-231.

Parwe, S.K. 2013. Nutritional evaluation of pomegranate orchards of south-east region Beed district by soil and leaf analysis. M.Sc. (Agriculture) thesis submitted to VNMKV, Parbhani.

Patil, M. N. 2010. Studies on soil and leaf nutrient status in relation to yield and quality of mango orchards in Latur district of Maharashtra. M.Sc. (Agri) thesis, submitted to VNMKV, Parbhani (M.S.), India.

Piper, C. S. 1966. *Soil and Plant Analysis*, IVth Edn. 135-200 Univ. of Adeleide, Australia.

Raghupathi, H. B. and Bhargava, B. S. 1997. Preliminary diagnostic soil fertility norms for alphanso mango. *J. Indian Soc. Soil Sci.*, 45(3): 534-536.

Raghupathi, H. B. and Bhargava, B. S. 1998. Leaf and soil nutrient diagnostic norms for pomegranate. *J. Indian Soc. Soil Sci.*, 46(3): 412-416.

Roman, S. D. 2015. Studies on effect of soil and leaf nutrient status on yield and quality of Pomegranate. M. Sc. (Agri) thesis submitted to VNMKV, Parbhani.