The Pharma Innovation Journal 2022; 11(10): 591-595

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(10): 591-595

www.thepharmajournal.com
Received: 16-07-2022
Accepted: 29-08-2022

Aal JM
Ph.D. Scholar, Department of Fruit Science, College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat, India

Karetha KM
Department of Post-Harvest Technology, College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat, India

Corresponding Author:
Aal JM
Ph.D. Scholar, Department of Fruit Science, College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat, India

Effect of foliar application of biostimulants and silicon on fruit set and drop of mango (*Mangifera indica* L.) cv. Kesar

Aal JM and Karetha KM

Abstract
The present investigation entitled "Effect of foliar application of biostimulants and silicon on fruit set and drop of mango (*Mangifera indica* L.) cv. Kesar" was carried out at Fruit Research Station, Sakkarbaug, Junagadh Agricultural University, Junagadh during 2020-21 and 2021-22. The experiment was laid out in Randomized Block Design with Factorial concept consisting two factors with three replications. The treatment comprised with biostimulants *viz.*, without biostimulant, humic acid (1.5%), panchagavya (3%), seaweed extract (0.2%), novel organic liquid fertilizer (2%) and silicon *i.e.*, without silicon, potassium silicate (0.2%) and Orthosilicic acid (0.2%). The results of the study indicated that among the different biostimulants foliar application of humic acid 1.5% and out of the different silicon foliar application of potassium silicate 0.2% was recorded with maximum number of fruits at grain (71.21 and 70.25), pea (15.19 and14.23) and marble stage (4.36 and 4.08), fruits at pea (21.27 and 20.21%) and marble stage (6.09 and 5.77%) and minimum fruits drop at pea (78.74 and 79.82%) and marble stage (93.91 and 94.23%) during in pooled analysis, respectively. Interaction effect between biostimulants and silicon failed to produce any significant effect on all the above parameters during the year 2020-21, 2021-22 and in pooled analysis. It can be concluded that for improved fruit set and reducing fruit drop with foliar application of humic acid 1.5% along with potassium silicate 0.2% at initiation of flowering, pea and marble stage.

Keywords: Biostimulants, silicon, mango, Kesar

1. Introduction

Mango (*Mangifera indica* L.) belongs to the family Anacardiaceae and the genus is believed to be originated in the Indo-Burma region. The fruit is having excellent adaptability and regarded as "King of Fruits." Moreover, Mango has been cultivated in Indian sub-continent for well over 4000 years and favourite of the kings and common people as well, because of its nutritive value, taste, attractive fragrance and health promoting qualities. Mango is one of the major fruit crop of Asia and has developed its own importance all over the world (Bose *et al*. 2001) [4]. Mango is a national fruit of India because of its excellent flavour, delicious taste, delicate fragrance and attractive colour. India is the largest producer of mango in the world with 21,882 thousand MT production on an area of 2,258 thousand hectares and productivity of 9.70 MT per hectare (Anon., 2018) [3]. The major mango growing states are Andhra Pradesh, Bihar, Gujarat, Uttar Pradesh, Maharashtra, Karnataka, Kerala, Tamil Nadu, Orissa and West Bengal. In Gujarat mango grow in total area of 1,66,358 ha and production is 1,22,2291 MT (Anon., 2019) [2]. Mango is chiefly cultivated in Valsad, Navsari, Surat, Bharuch, Rajkot, Jamnagar, Kutch and Junagadh districts because of favorable agro-climatic conditions.

Biostimulant as a substance or microorganism that, when applied to seeds, plants, or the rhizosphere, stimulates natural processes to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress, or crop quality and yield. Plant biostimulants promoted as environment-friendly alternatives to chemical based products. Although the major driving force for these materials is the organic farming industry, consumer demands for more sustainable crop production along with a growing number of reports regarding their beneficial properties have resulted in increasing popularity among conventional farmers. Pre-harvest application of biostimulant has also become an alternative approach to minimize the use of chemical fertilizers. Humic acid is one of the biostimulant which are known as the organic materials that promote plant growth and help plant to withstand harsh environment when applied in small quantities.

It is highly beneficial to both plant and soil; it maintains proper plant growth as well as it increases nutrient uptake, tolerance to drought and temperature extremes, activity of beneficial soil microorganism and availability of soil nutrients particularly in alkaline soils and low organic matter without excessive use of agricultural chemicals which considered a means of the environment. In Sanskrit, panchagavya means the blend of five products obtained from cow namely dung, urine, milk, curd and ghee. Presence of naturally occurring, beneficial, effective microorganisms (EMO's) in panchagavya predominantly and lactic acid bacteria, yeast, actinomycetes photosynthetic bacteria and certain fungi besides beneficial and proven fertilizers such as *Acetobacter*, *Azospirillum* and *Phosphobacterium* were detected which have the beneficial effect especially in improving soil quality, growth and yield of crops (Xu and Xu, 2000 and Selvaraj *et al*., 2007) [15, 14]. Seaweeds are green, brown and red marine macroalgae. Extracts of brown seaweeds are widely used in horticulture crops largely for their plant growth promoting effects and for their ameliorating effect on crop tolerance to abiotic stresses such as salinity, extreme temperatures, nutrient deficiency and drought. Novel organic liquid fertilizer (NOLF) suitable for foliar and soil application. Sap obtained from banana pseudostem contains ample amount of essential nutrient and plant growth hormone for growth and development of crops. Use of this sap in different crops according to recommendation given by Navsari Agricultural University.

Silicon is the eighth most common element in nature and the second most abundant element found in soil in next to oxygen. However, still it is not recognized as an essential element for plant growth but the undeniable beneficial effects of this element on the growth and development have been observed in a wide variety of plant species. The role of silicon in plant biology is to reduce multiple stresses including biotic and abiotic stresses. In addition to naturally occurring soluble silicon in soil, many crops respond positively to additions of supplemental silicon. Plants, especially fruit crops, can take up large amounts of silicon where it contributes to their mechanical strength. Besides a structural role, silicon helps to protect plants from insect attack, disease and environmental stress. In the context of organic farming, the application of silicon sources to fruit crops may pave way for increasing the yield and reducing the use of chemical fertilizers, pesticides and fungicides.

For successful production of mango fruit setting is an important factor. Now a day's farmers facing a problem of poor fruit setting. Despite of good quality production of fruit on a commercial scale is confronted with various problems such as lack of flowering, heavy fruit drop, small and irregular size of fruits, affected by various biotic and abiotic stress and poor yield. There is heavy drop of hermaphrodite flowers and young fruits. Its amounting 99% or more. Biostimulants stimulates natural processes to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress or crop quality and yield. Plants can take up silicon where it contributes to their mechanical strength. Besides a structural role, silicon helps to protect plants from insect attack, disease and environmental stress. So, exogeneous application of biostimulants and silicon play a major role in the enhancing fruit setting, reducing fruit drop and increasing yield and quality. Keeping these in view, the present experiment is undertaken to see the "Effect of foliar application of biostimulants and silicon on fruit set and drop of mango (*Mangifera indica* L.) cv. Kesar".

2. Materials and Methods

The present investigation entitled "Effect of foliar application of biostimulants and silicon on fruit set and drop of mango (*Mangifera indica* L.) cv. Kesar" was carried out at Fruit Research Station, Sakkarbaug, College of Horticulture, Junagadh Agricultural University, Junagadh during 2020-21 and 2021-22. The experiment was laid out in Randomized Block Design with Factorial concept (FRBD) consisting two factors with three replications and fifteen treatment combinations. The treatment comprised with biostimulants *viz*., without biostimulant, humic acid (1.5%), panchagavya (3%), seaweed extract (0.2%), novel organic liquid fertilizer (2%) and silicon *i.e*., without silicon, potassium silicate (0.2%) and orthosilicic acid (0.2%). The different treatments combinations were T_1: Without biostimulant + Without silicon (Control), T_2: Without biostimulant + Potassium silicate 0.2%, T_3: Without biostimulant + Orthosilicic acid 0.2%, T_4: Humic acid 1.5% + Without silicon, T_5: Humic acid 1.5% + Potassium silicate 0.2%, T_6: Humic acid 1.5% + Orthosilicic acid 0.2%, T_7: Panchagavya 3% + Without silicon, T_8: Panchagavya 3% + Potassium silicate 0.2%, T_9: Panchagavya 3% + Orthosilicic acid 0.2%, T_{10}: Seaweed extract 0.2% + Without silicon, T_{11}: Seaweed extract 0.2% + Potassium silicate 0.2%, T_{12}: Seaweed extract 0.2% + Orthosilicic acid 0.2%, T_{13}: Novel organic liquid fertilizer 2% + Without silicon, T_{14}: Novel organic liquid fertilizer 2% + Potassium silicate 0.2%, T_{15}: Novel organic liquid fertilizer 2% + Orthosilicic acid 0.2%. The experimental material consisted of 13 years old grafted tree of mango cultivar of Kesar is being a most important commercial cultivar of Saurashtra region. These trees are spaced at 6 × 6 meter distance. In all 45 uniform trees of Kesar were selected for the experimentation. The solution of biostimulants and silicon were prepared by dissolving them in water directly and sprayed with the help of foot sprayer at initiation of flowering, pea and marble stage. Spraying was done in a clear and calm day during the morning hours to obtain better effect. The spraying was done till the leaves and twigs were wet and droplets of solutions started trickling down. For observations the uniform, pest and disease-free panicles of mango in different direction were selected and tagged randomly on each tree. Two panicles were tagged in each direction (North-South- East- West) and total eight panicles were tagged on each tree. The observations on different parameters of each treatment were computed and statistically analyzed.

3. Results and Discussion

The effect of various treatments was recorded and the results obtained during the course of investigation were discussed with reasoning and supporting references. The entire results and discussion have been presented in following head:

3.1 Effect of biostimulants

The data from investigation revealed that application of different biostimulants exerted significant influence on different parameters *viz*., number of fruits at grain, pea and marble stage, fruits at pea and marble stage (%), fruits drop at pea and marble stage (%) during the year 2020-21 and 2021-22 and in pooled data (Table 1 to 3).

The maximum number of fruits at grain (71.67, 70.75 and 71.21), pea (15.77, 14.62 and 15.19) and marble stage (4.83, 3.89 and 4.36), fruits at pea (21.96, 20.57 and 21.27%) and marble stage (6.70, 5.47 and 6.09%) and minimum fruits drop at pea (78.05, 79.43 and 78.74%) and marble stage (93.29, 94.54 and 93.91%) were recorded with the foliar application of humic acid 1.5% (B_1) during the year 2020-21, 2021-22 and in pooled analysis, respectively. While, in case of number of fruits at grain stage obtained under treatment B_1 was at par with treatment B_2 and B_4 during both the years as well as in pooled data, while B_3 during both the years only. Number of fruits at pea stage obtained under treatment B_1 was found at par with treatment B_2 during both the years only. Number of fruits at marble stage obtained under treatment B_1 was found at par with treatment B_2 during year 2021-22 only. Fruits percentage at pea stage obtained under treatment B_1 was at par with treatment B_2 during the year 2020-21 and 2021-22. Fruits percentage at marble stage obtained under treatment B_1 was at par with treatment B_2 during the year 2021-22 only. Fruits drop percentage at pea stage obtained under treatment B_1 was statistically at par with treatment B_2, B_3 and B_4 during both the year, while in pooled result it was at par with B_2 only. Fruits drop percentage at marble stage obtained under treatment B_1 was at par with treatment B_2, B_3 and B_4 during both the year, while in pooled result it was at par with B_2 and B_4 only. Whereas, without biostimulants (B_0) treatment was noted poor performance in all the above characters during year 2020-21, 2021-22 and in pooled analysis.

Maximum number of fruits at grain, pea and marble stage, fruits percentage at pea and marble stage, minimum fruits drop percentage at pea and marble stage might be due to the positive influence can be attributed to the strength provided by the humic acid as it has been reported to behave like auxins (Canellas *et al.*, 2002) [5] which cause a delay in abscission, chelates metal ions under alkaline soil conditions and improves the availability of nutrients to plants (Zhang *et al.*, 2010) [16]. Humus substances present in humic acid could have mobilized the reserve food materials to the sink through increased activity of hydrolyzing and oxidizing enzymes. This would have helped the better availability and utilization of nutrients. The efficiency of applied inorganic fertilizer is quite low due to calcareous nature and alkaline conditions of the soil. The application of humic acid works as a chelating agent for nutrients already present in the soil and make them available to plant. The scientific literature has recently demonstrated that humic acid exert directly or indirectly effects on plant growth processes such as morphological, physiological, genetic and biochemical process. The results are in conformity with those found by Patel *et al.* (2019) [13] and Momin *et al.* (2016) [12] in mango; Khattab *et al*. (2012) [9] in pomegranate; Fatma *et al.* (2015) [6] in apricot and Hidayatullah *et al*. (2018) [7] in apple.

3.2 Effect of silicon

Similar trend of biostimulants was also observed in silicon and variation due to different silicon was also observed significant effect on different parameters *viz.*, number of fruits at grain, pea and marble stage, fruits at pea and marble stage (%), fruits drop at pea and marble stage (%) during the year 2020-21, 2021-22 and in pooled data (Table 1 to 3).

Furthermore, foliar application of potassium silicate 0.2% (S_1) was registered with maximum number of fruits at grain (70.73, 69.78 and 70.25), pea (14.81, 13.65 and 14.23) and marble stage (4.48, 3.69 and 4.08), fruits at pea (20.86, 19.57 and 20.21%) and marble stage (6.29, 5.26 and 5.77%), minimum fruits drop at pea (79.12, 80.51 and 79.82%) and marble stage (93.71, 94.75 and 94.23%) during individual years as well as in pooled data analysis, respectively. While, in case of number of fruits at grain, pea and marble stage and fruits percentage at pea stage obtained under treatment S_1 was found at par with treatment S_2 during both the year as well as in pooled data analysis. Fruits percentage at marble stage obtained under treatment S_1 was found at par with treatment S_2 during the year 2020-21 and 2021-22 only. Fruits drop percentage at pea and marble stage obtained under treatment S_1 was found at par with treatment S_2 during both the years as well as in pooled data analysis. However, poor performance was registered in treatment without silicon (S_0) in all the above characters during the year 2020-21, 2021-22 and in pooled data.

Maximum number of fruits at grain, pea and marble stage, fruits percentage at pea and marble stage, minimum fruits drop percentage at pea and marble stage might be attributed to the essential role of silicon and responding the adverse effects of water stress and disorders on growth and fruiting as well as enhancing the tolerance of the trees to drought, water transport and root development. The finding has close conformity with Kachhadia *et al.* (2020) [8], Abd El-Rahman (2015) [1] and Moawad *et al*. (2015) [11] in mango; Masoud *et al.* (2019) [10] in Balady mandarin.

3.3 Interaction effect of biostimulants and silicon

Interaction effect between biostimulants and silicon failed to produce any significant effect on number of fruits at grain, pea and marble stage, fruits percentage at pea and marble stage, fruits drop percentage at pea and marble stage during the year 2020-21, 2021-22 and in pooled data (Table 1 to 3)

Table 1: Effect of biostimulants and silicon on number of fruits at grain, pea and marble stage of mango cv. Kesar

Treatments	Number of fruits at grain stage			Number of fruits at pea stage			Number of fruits at marble stage		
	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
Biostimulants (B)									
B_0 – Control (Without biostimulant)	67.18	66.24	66.71	11.30	10.12	10.71	3.19	2.76	2.98
B_1 – Humic acid (1.5%)	71.67	70.75	71.21	15.77	14.62	15.19	4.83	3.89	4.36
B_2 – Panchagavya (3%)	70.58	69.65	70.11	14.72	13.53	14.12	4.38	3.70	4.04
B_3 – Seaweed extract (0.2%)	69.13	68.15	68.64	13.20	12.03	12.62	3.90	3.32	3.61
B_4 – Novel organic liquid fertilizer (2%)	69.82	68.79	69.31	13.93	12.69	13.31	4.14	3.49	3.82
S.Em.±	0.97	0.94	0.68	0.46	0.43	0.32	0.12	0.10	0.08
C.D. at 5%	2.81	2.73	1.92	1.35	1.25	0.90	0.36	0.30	0.23
Silicon (S)									
S_0 – Control (Without silicon)	68.09	67.13	67.61	12.22	11.03	11.63	3.55	3.06	3.30

S_1 – Potassium silicate (0.2%)	70.73	69.78	70.25	14.81	13.65	14.23	4.48	3.69	4.08
S_2 – Orthosilicic acid (0.2%)	70.20	69.24	69.72	14.32	13.12	13.72	4.24	3.56	3.90
S.Em.±	0.75	0.73	0.52	0.36	0.33	0.25	0.10	0.08	0.06
C.D. at 5%	2.18	2.11	1.48	1.04	0.97	0.69	0.28	0.24	0.18
Interaction (B X S)									
S.Em.±	1.68	1.63	1.17	0.80	0.75	0.55	0.21	0.18	0.14
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV%	4.18	4.11	4.15	10.11	10.25	10.18	9.01	9.16	9.11
Year									
S.Em.±			0.43			0.20			0.05
C.D. at 5%			NS			0.57			0.14
Y X B									
S.Em.±			0.96			0.45			0.11
C.D. at 5%			NS			NS			NS
Y X S									
S.Em.±			0.74			0.35			0.09
C.D. at 5%			NS			NS			NS
Y X B X S									
S.Em.±			1.66			0.78			0.20
C.D. at 5%			NS			NS			NS

Table 2: Effect of biostimulants and silicon on fruits at pea and marble stage of mango cv. Kesar

Treatments	Fruits at pea stage (%)			Fruits at marble stage (%)		
	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
Biostimulants (B)						
B_0 – Control (Without biostimulant)	16.81	15.34	16.08	4.73	4.17	4.45
B_1 – Humic acid (1.5%)	21.96	20.57	21.27	6.70	5.47	6.09
B_2 – Panchagavya (3%)	20.81	19.59	20.20	6.19	5.28	5.73
B_3 – Seaweed extract (0.2%)	19.03	17.86	18.45	5.64	4.88	5.26
B_4 – Novel organic liquid fertilizer (2%)	19.88	18.39	19.13	5.92	5.06	5.49
S.Em.±	0.48	0.44	0.32	0.12	0.11	0.08
C.D. at 5%	1.38	1.26	0.92	0.36	0.33	0.24
Silicon (S)						
S_0 – Control (Without silicon)	17.91	16.46	17.18	5.19	4.55	4.87
S_1 – Potassium silicate (0.2%)	20.86	19.57	20.21	6.29	5.26	5.77
S_2 – Orthosilicic acid (0.2%)	20.33	19.03	19.68	6.02	5.11	5.57
S.Em.±	0.37	0.34	0.25	0.10	0.09	0.07
C.D. at 5%	1.07	0.98	0.71	0.28	0.26	0.18
Interaction (B X S)						
S.Em.±	0.83	0.76	0.56	0.21	0.20	0.15
C.D. at 5%	NS	NS	NS	NS	NS	NS
CV%	7.27	7.13	7.21	6.34	6.88	6.59
Year						
S.Em.±			0.20			0.05
C.D. at 5%			0.58			0.15
Y X B						
S.Em.±			0.46			0.12
C.D. at 5%			NS			NS
Y X S						
S.Em.±			0.35			0.09
C.D. at 5%			NS			NS
Y X B X S						
S.Em.±			0.79			0.21
C.D. at 5%			NS			NS

Table 3: Effect of biostimulants and silicon on fruits drop at pea and marble stage of mango cv. Kesar

Treatments	Fruits drop at pea stage (%)			Fruits drop at marble stage (%)		
	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
Biostimulants (B)						
B_0 – Control (Without biostimulant)	83.16	84.74	83.95	95.27	95.83	95.55
B_1 – Humic acid (1.5%)	78.05	79.43	78.74	93.29	94.54	93.91
B_2 – Panchagavya (3%)	79.20	80.63	79.92	93.81	94.73	94.27
B_3 – Seaweed extract (0.2%)	80.93	82.37	81.65	94.36	95.11	94.73
B_4 – Novel organic liquid fertilizer (2%)	80.14	81.60	80.87	94.08	94.94	94.51
S.Em.±	1.06	1.06	0.75	0.39	0.26	0.24
C.D. at 5%	3.06	3.07	2.12	1.14	0.75	0.67

Silicon (S)						
S_0 – Control (Without silicon)	82.07	83.61	82.84	94.80	95.45	95.13
S_1 – Potassium silicate (0.2%)	79.12	80.51	79.82	93.71	94.75	94.23
S_2 – Orthosilicic acid (0.2%)	79.69	81.14	80.41	93.98	94.89	94.43
S.Em.±	0.82	0.82	0.58	0.30	0.20	0.18
C.D. at 5%	2.37	2.38	1.64	0.88	0.58	0.52
Interaction (B X S)						
S.Em.±	1.83	1.84	1.30	0.68	0.45	0.41
C.D. at 5%	NS	NS	NS	NS	NS	NS
CV%	3.95	3.89	3.92	1.25	0.82	1.06
Year						
S.Em.±			0.47			0.15
C.D. at 5%			1.34			0.42
Y X B						
S.Em.±			1.06			0.33
C.D. at 5%			NS			NS
Y X S						
S.Em.±			0.82			0.26
C.D. at 5%			NS			NS
Y X B X S						
S.Em.±			1.83			0.58
C.D. at 5%			NS			NS

4. Conclusion

On the basis of present investigation, results obtained and the discussions made regarding the impacts of the study, it can be concluded that the foliar application of humic acid 1.5% along with potassium silicate 0.2% at the time of initiation of flowering, pea and marble stage improved fruit set and reducing fruit drop in mango cv. Kesar.

5. References

1. Abd El- Rahman MMA. Relation of spraying silicon with fruiting of Keitte mango trees growing under Upper Egypt conditions. Stem Cell. 2015;6(2):1-5.
2. Anonymous. Directorate of Horticulture, Gujarat state, Gandhinagar. Available at www.doh.gujarat.gov.in 2019, accessed on 10 January, 2021.
3. Anonymous. Horticultural Statistics at a Glance-2018. National Horticulture Board, Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India. Oxford publication, http://nhb.gov.in/statistics/Publication/Horticulture 2018, 9, accessed on 10 January, 2021.
4. Bose TK, Mitra SK, Sanyal D. Fruits: Tropical and Subtropical. Edn 3, Vol. I, Naya Udyog, Calcutta, 2001.
5. Canellas LP, Olivares FL, Okorokova AL, Facanha AR. Humic acid isolated from earthworm compost enhance root elongation, lateral root emergence and plasma H+ATPase activity in maize root. Journal of Plant Physiology 2000;130:1951-1957.
6. Fatma KMS, Morsey MM, Thanaa Sh MM. Influence of spraying yeast extract and humic acid on fruit maturity stage and storability of Canino apricot fruits. International Journal of Chem Tech Research. 2015;8(6):530-543.
7. Hidayatullah KA, Mouladad Mirwise Ahmed N, Shah SA. Effect of humic acid on fruit yield attributes, yield and leaf nutrient accumulation of apple trees under calcareous soil. Indian Journal of Science and Technology. 2018;11(15):1-8.
8. Kachhadia P, Patel BN, Bhanderi DR, Patel D. Effect of foliar spray of silicon and boron on fruiting and yield of rejuvenated mango cv. Sonpari. International Journal of Chemical Studies. 2020;8(4):1421-1425.
9. Khattab MM, Shaban AE, El-Shrief AH, El-Deen AS. Effect of humic acid and amino acids on pomegranate trees under deficit irrigation on growth, flowering and fruiting. Journal of Horticultural Science and Ornamental Plants. 2012;4(3):253-259.
10. Masoud AAB, Fatma El-Zahraa M, Goudaand OAK. Effect of foliar application of zinc, boron and silicon on growth and fruiting of Balady mandarin trees. Assiut Journal Agricultural Sciences. 2019;50(2):206-218.
11. Moawad AM, Mohamed AE, Hamdy AM. Response of Succary mango trees to foliar application of silicon and boron. World Rural Observations. 2015;7(2):93-98.
12. Momin SK, Gaikwad SS, Patil SJ, Bhalerao PP. Effect of foliar application of chemicals on fruiting parameters of mango cv. Kesar. Research Journal of Agricultural Sciences. 2016;7(1):143-144.
13. Patel SJ, Parekh DD, Aal JM. Effect of foliar application of humic acid, salicylic acid and novel liquid on fruit drop and yield of mango cv. Amrapali. International Journal of Chemical Studies. 2019;7(5):4558-4560.
14. Selvaraj J, Ramaraj B, Devarajan K, Seenivasan N, Senthilkumar S, Sakthi E. Effect of organic farming on growth and yield of thyme. In: Articles and Abstracts of National Sem. Prod. Utiliz. Medicinal Plant, 13-14, Marchheld at Annamalai University Tamil Nadu, 63. 2003.
15. Xu Hui Lian, Xu HL. Effects of a microbial inoculants and organic fertilizers on growth, photosynthesis and yield of sweet corn. Journal of Crop Production. 2000;3(1):183-214.
16. Zhang JJ, Wang LB, Li CL. Humus characteristics after maize residues degradation in soil amended with different copper concentrations. Plant Soil Environment. 2010;56:120-124.