International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 963-965

Received: 21-07-2018
Accepted: 24-08-2018

VM Chovatiya
Ph.D. (Horticulture) Scholar, Department of Horticulture, College of Agriculture, JAU Junagadh, Gujarat, India

RS Chovatia
Professor and Head, Department of Horticulture, JAU, Junagadh Agril, University, Junagadh, Gujarat, India

SR Aghera
Research Associate, Department of Horticulture, JAU, Junagadh Agril. University, Junagadh, Gujarat, India

Correspondence
VM Chovatiya
Ph.D. (Horticulture) Scholar, Department of Horticulture, College of Agriculture, JAU Junagadh, Gujarat, India

Effect of integrated nutrient management on flowering of pomegranate cv. Bhagawa

VM Chovatiya, RS Chovatia and SR Aghera

Abstract
The present investigation entitled "Integrated nutrient management in pomegranate (*Punica granatum* L.) cv. *Bhagawa*" was carried out at Vadla village, Junagadh during the year 2016-17 and 2017-18. The experiment was laid out in randomized block design with nine different treatment combinations of chemical fertilizers, organic manures and biofertilizers with three replications. During study, the treatment T_7-75% RDNK + full P + *Azotobacter* (5.0 ml/plant) + KSB (5.0 ml/plant) was found significant to flower the pomegranate plants earlier (38.3 days) and also to expand the flowering span (47.59 days). The same treatment has given significantly highest number flowers/shoot (7.42), fruit set (75.79 %) as well as minimum male flowers (51.26 %) and maximum hermaphrodite flowers (48.74 %).

Keywords: integrated nutrient management, pomegranate, cv. Bhagawa, chemical fertilizers, organic manures, biofertilizers, flowering

Introduction
From an export point of view, pomegranate is one of the important crops of arid and semi-arid regions of India. It is a hardy fruit crop and can be grown successfully even on marginal soils. Major pomegranate producing belts in Gujarat are Banaskantha, Patan and Kutch. Gujarat has 9400 ha area under pomegranate cultivation, producing 99,300 MT annually with productivity of 10.6 MT/ha (Anon., 2017) [1]. Ganesh, Bhagawa and Dholka are the recommended varieties for Gujarat by National Horticulture Board. Whereas *Bhagawa* also known as *Sinduri* cultivar has earned much popularity in Saurashtra region (Gujarat) because of its wide soil and climatic adaptability.

Integrated nutrient management (Definition): The combined use of different sources of plant nutrients i.e. organic, biological and inorganic amendments for the maintenance and improvement of soil fertility and plant nutrient supply at an optimum level for desired crop productivity may be termed as integrated nutrient management.

Materials and methods
The present investigation entitled "Integrated nutrient management in pomegranate (*Punica granatum* L.) cv. *Bhagawa*" was carried out at Vadla village, Junagadh during the year 2016-17 and 2017-18. The experiment was laid out in randomized block design with nine different treatment combinations of chemical fertilizers, organic manures and biofertilizers with three replications. The different treatments were T_1 (100% RDF- 500:250:500 g NPK$plant^{-1}$), T_2 (75% RDF + 25% N from FYM), T_3 (75% RDF + 25% N from Vermicompost), T_4 (75% RDF + 25% N from Poultry Manure), T_5 (75% RDN + full P and K + *Azotobacter* (5.0 ml/plant)), T_6 (75% RDNP + full K + *Azotobacter* (5.0 ml/plant) + PSB (5.0 ml/plant)), T_7 (75% RDNK + full P + *Azotobacter* (5.0 ml/plant) + KSB (5.0 ml/plant)), T_8 (75% RDF + *Azotobacter* (5.0 ml/plant) + PSB (5.0 ml/plant) + KSB (5.0 ml/plant)) and T_9 (25%N from FYM + 25%N from Vermicompost + 25% N from Poultry Manure + BF (Azotobacter + PSB + KSB each 5.0 ml/plant)). Half quantity of nitrogen and potash and whole quantity of phosphorus and FYM, vermi-compost and poultry manure according to each treatment was applied as basal application (15th October), whereas remaining nitrogen and potash was given during fruit development stage (February) as second application. Bio-fertilizers were given 21 days after basal application.

Results

Flowering observation: The flowering observations of the pomegranate orchard *viz.* days to flowering, flowering span (days), no. of flowers/shoot, fruit set (%) as well as percentage of male flowers and hermaphrodite flowers are tabulated in Table 1, 2 and 3.

Days to flowering (days): The results from table 01 shows that pomegranate plants treated with treatment T_7-75% RDNK + full P + *Azotobacter* (5.0 ml/plant) + KSB (5.0 ml/plant) took the minimum days for flowering (28.3, 48.3 and 38.3 days) during the year 2016-17, 2017-18 and in pooled. Which was at par with treatment T_8 and T_9 during first year, T_8, T_9 and T_6 during second year and T_9 and T_8 in pooled. The maximum days to flower (34.7, 54.7 and 44.7 days) were recorded with treatment T_1-100% RDF (chemical fertilizers) during both years as well as in pooled, respectively.

Flowering span (days): Table 01 clearly indicates that the treatment T_7-75% RDNK + full P + *Azotobacter* (5.0 ml/plant) + KSB (5.0 ml/plant) has significantly enlarged the flowering span (46.43, 48.75 and 47.59 days) during both the years as well as in pooled, respectively. The shortest flowering span (37.23, 38.64 and 37.94 days) was recorded with treatment T_1-100% RDF (chemical fertilizers) during both the years as well as in pooled, respectively.

No. of flowers/shoot: Data of table 02 revealed that maximum number of flowers per shoot (6.89, 7.95 and 7.42) was found in treatment T_7-75% RDNK + full P + *Azotobacter* (5.0 ml/plant) + KSB (5.0 ml/plant) during both the years and in pooled, respectively. Which was at par with treatments T_8 and T_9 during both the year as well as in pooled. The minimum number of flowers (3.83, 4.92 and 4.37) was recorded with treatment T_1-100% RDF (chemical fertilizers) during both of the year and also in pooled.

Fruit set percentage: The fruit set percentage (76.91, 74.67 and 75.79 %) was found significantly highest with treatment T_7-75% RDNK + full P + *Azotobacter* (5.0 ml/plant) + KSB (5.0 ml/plant) during both the years as well as in pooled, respectively (Table 02). The treatment T_7 was found statistically at par with treatment T_8 and T_9 during both the year and also with treatment T_6 in pooled. The minimum fruit set percentage (66.23, 64.74 and 65.49 %) was observed in treatment T_1 during both the years as well as in pooled, respectively. It was also at par with treatment T_2 and T_3 during both the years.

Male flower percent: The data pertaining to male flower percent are presented in table 03. It is clearly indicated that no any treatment had significant effect on male flower percentage during both the years. However, treatment T_7-75% RDNK + full P + *Azotobacter* (5.0 ml/plant) + KSB (5.0 ml/plant) was found significant in pooled and has produced the minimum male flowers (51.26 %). The treatment T_7 was remained at par with treatment T_9, T_8 and T_6.

Hermaphrodite flower percent: The data related to hermaphrodite flower percent are presented in table 03. It is clearly indicated that no any treatment had significant effect on hermaphrodite flower percentage during both the years. However, treatment T_7-75% RDNK + full P + *Azotobacter* (5.0 ml/plant) + KSB (5.0 ml/plant) was found significant in pooled and has produced maximum hermaphrodite flowers (48.74 %) and it remained at par with treatment T_9, T_8 and T_6.

Discussion

The results from table 1 clearly indicate that the treatment T_7-75% RDNK + full P + Azotobacter (5.0 ml/plant) + KSB (5.0 ml/plant) has significantly reduced the number of days to flower and induced early flowering in pomegranate plants. The results have close conformity with Singh (2008) [8] and Singh (2011) [9] in banana, Tripathi *et al.* (2014) [11] in strawberry, Bhalerao *et al.* (2009) [4] and Patel and Patel (2011) [7] in banana.

The longest flowering span was observed in treatment T_7-75% RDNK + full P + Azotobacter (5.0 ml/plant) + KSB (5.0 ml/plant). This might be due to soil application of Azotobacter and KSB, which had allowed early flowering in pomegranate plants and may have managed continuous supply of available nitrogen and available potassium to plants and made plants to flower few more days as compared to other treatments. The findings have close relation with researches of Patel and Patel (2011) [7] in citrus and Aseri *et al.* (2008) [2] in pomegranate.

The average number of flowers per shoot was recorded high with treatment T_8-75% RDF + Azotobacter (5.0 ml/plant) + PSB (5.0 ml/plant) + KSB (5.0 ml/plant). The same results were reflected with Singh (2008) [8] in pomegranate, Singh (2008) [8] in banana and Mani *et al.* (2013) [10] in phalsa and Tripathi *et al.* (2014) [11] in strawberry.

The highest fruit set (76.91, 74.67 and 75.79 %) was recorded with treatment T_7- 75% RDNK + full P + Azotobacter (5.0 ml/plant) + KSB (5.0 ml/plant) during both the year as well as in pooled, respectively The increased nutrient availability from the biofertilizers might have increased various endogenous hormonal levels in the plant tissue might be responsible for enhanced pollen germination and tube growth, ultimately increased the fruit set as well as number of fruit per plant. The finding have close conformity with Singh (2008) [8] in pomegranate, Baksh *et al.* (2008) [3], Dhomane *et al.* (2011) [5] and Godage *et al.* (2013) [6] in guava, Yadav *et al.* (2009) [12] in aonla and Yadav *et al.* (2011) [13] in papaya.

The percentage of male and hermaphrodite flowers was found non-significant with different treatments of integrated nutrient management. As this proportion depends on genetic pool of the plant and variety as well as the plant growth regulators, it can't be changed with type of nutrient's sources.

Conclusion

Based on the present investigation it can be concluded that the treatment combination of chemical fertilizers with biofertilizers can result far better from use of chemical fertilizers singly for reducing days to flower, increasing flowering span, no of flowers per shoot and fruit set percentage as well as minimum male flowers and maximum hermaphrodite flowers.

Table 1: Effect of integrated nutrient management on days to flowering and flowering span of pomegranate cv. Bhagava

Sr. no.	Days to flowering (days)			Flowering span (days)		
	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled
T_1	34.7	54.7	44.7	37.23	38.64	37.94
T_2	35.3	56.7	46.0	38.50	40.50	39.50
T_3	37.3	58.0	47.7	39.83	41.83	40.83
T_4	35.3	56.3	45.8	40.17	41.83	41.00
T_5	34.3	56.7	45.5	40.17	41.83	41.00
T_6	33.3	53.0	43.2	41.00	42.83	41.92
T_7	28.3	48.3	38.3	46.43	48.75	47.59
T_8	30.7	49.0	39.8	43.17	46.76	44.96
T_9	30.0	50.0	40.0	42.17	44.17	43.17
S. Em.±	1.78	2.01	1.34	0.37	0.45	0.29
C.D. at 5 %	5.32	6.01	3.86	1.11	1.35	0.84
C.V. %	9.24	6.48	7.71	8.57	7.82	8.30

Table 2: Effect of integrated nutrient management on no. of flowers per shoot and fruit set of pomegranate cv. Bhagava

Sr. no.	No. of flowers per shoot			Fruit set (%)		
	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled
T_1	3.83	4.92	4.37	66.23	64.74	65.49
T_2	4.57	5.67	5.12	70.40	68.82	69.61
T_3	4.81	5.89	5.35	70.47	68.33	69.40
T_4	4.85	5.98	5.42	70.20	68.08	69.14
T_5	4.89	5.97	5.43	70.12	68.00	69.06
T_6	5.20	6.28	5.74	72.51	70.31	71.41
T_7	6.89	7.95	7.43	76.91	74.67	75.79
T_8	6.85	7.95	7.40	76.56	74.33	75.45
T_9	5.93	7.44	6.69	74.85	72.67	73.76
S. Em.±	0.24	0.21	0.16	1.94	1.89	1.36
C.D. at 5 %	0.72	0.63	0.46	5.82	5.67	3.91
C.V. %	7.80	8.67	8.34	8.67	7.68	8.27

Table 3: Effect of integrated nutrient management on male flower and hermaphrodite flowers of pomegranate cv. Bhagava

Sr. no.	Male flowers (%)			Hermaphrodite flowers (%)		
	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled
T_1	55.34	53.33	54.34	44.66	46.67	45.66
T_2	56.13	55.42	55.78	43.87	44.58	44.22
T_3	53.88	53.44	53.66	46.12	46.56	46.34
T_4	54.55	54.46	54.50	45.45	45.54	45.50
T_5	53.76	54.39	54.07	46.25	45.61	45.93
T_6	53.51	52.62	53.07	46.49	47.38	46.93
T_7	48.85	53.67	51.26	51.15	46.33	48.74
T_8	50.77	54.00	52.39	49.23	46.00	47.61
T_9	52.07	50.50	51.28	47.93	49.51	48.72
S. Em.±	1.4244	0.8975	0.8418	1.4244	0.8975	0.8418
C.D. at 5 %	NS	NS	2.4262	NS	NS	2.4262
C.V. %	4.64	2.9	3.86	5.27	3.35	4.42

References

1. Anonymous. Pomegranate. National Horticulture Database, National Horticulture Board, New Delhi, India, 2017, 144-146.
2. Aseri GK, Jain N, Panwar J, Rao AV, Meghwal PR. Biofertilizers improve plant growth, fruit yield, nutrition, metabolism and rhizosphere enzyme activities of pomegranate (*Punica granatum* L.) in Indian Thar Desert. Scientia Horticulturae. 2008; 117(2):130-135.
3. Baksh H, Yadav R, Dwivedi R. Effect of INM on growth, yield, yield attributing characters and quality of guava (*P. guajava* L.) cv. Sardar. Prog. Agri. 2008; 8(2):141-144.
4. Bhalerao VP, Patil NM, Badgujar CD, Patil DR. Studies on integrated nutrient management for tissue cultured Grand Naine banana. Ind. J Agric. Res. 2009; 43(2):107-109.
5. Dhomane PA, Kadam AS, Lakade SK, Gharage VR. Effect of different sources of nitrogen on growth and yield of guava (*Psidium guajava* L.) cv. Sardar. Asian J Hort. 2011; 6(1):92-95.
6. Godage SS, Parekh NS, Nehete DS. Influence of biofertilizers and chemical fertilizers on growth, flowering and fruit characters of guava (*Psidium guajava* L.) cv. Allahabad Safeda. Int. J Agric. Sci. 2013; 9(1):309-313.
7. Patel AN, Patel AR. Effect of biofertilizers and vermicompost on growth, yield and quality of banana cv. Basrai (AAA) under high density planting. Agric. Sci. Res. J. 2011; 2(3):497-501.
8. Singh V. Effects of various organic manures, inorganic fertilizers and *Azotobacter* on plant growth, flowering, fruiting and yield of pomegranate (*Punica granatum* L.) cv. 'Bhagava'. Asian J Hort. 2008; 3(2):382-385.
9. Singh AK, Singh SK, Singh BK, Singh R, Mishra R, Rat VK. Effect of inorganic and biofertilizers on growth and yield of (*Punica granatum* L.) cv. Bhagava. Environment and Ecology. 2011; 29(3):1082-1086.
10. Singh JK, Varu DK. Effect of integrated nutrient management in papaya (*Carica papaya* L.) cv. Madhubindu. The Asian J of Hort. 2013; 8(2):667-670.
11. Tripathi VK, Mishra AN, Kumar S, Tiwari B. Efficacy of *Azotobacter* and PSB on vegetative growth, flowering, yield and quality of strawberry cv. Chandler. Prog. Hort. 2014; 46(1):48-53.
12. Yadav DK, Singh G, Singh AK, Yadav AL. Effect of integrated nutrient management on productivity and fruit quality of aonla (*Emblica officinalis* Gaertn.). Pl. Arch. 2009; 9(1):387-389.
13. Yadav PK, Yadav AS, Yadav HC. Effect of integrated nutrient nourishment on vegetative growth and physico-chemical attributes of papaya (*Carica papaya* L.) fruit cv. Pusa Dwarf. Pl. Arch. 2011b; 11(1):327-329.