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Effect of nutrient scheduling on flowering, fruit set and yield of pomegranate (*Punica granatum* L.) Cv. Phule Bhagwa Super

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Abstract
The experiment was conducted on 4 year old pomegranate orchard in *Ambia bahar* at Instructional Cum Research Orchard, Arid Zone Fruit project, Department of Horticulture, MPKV., Rahuri, Dist. Ahmednagar during 2015-16 (Trial 1) and 2016-17 (Trial 2). The experiment was conducted in Randomized Block Design. Treatments were replicated in three times. Observations on flowering and yield parameters were recorded. There were eight treatments in which RDF (625:250:250 NPK g/plant) was split in different schedules. Treatment T_2 i.e. scheduling of nutrient *viz.*, 50% N, 40% P_2O_5 and 25% K_2O as a basal application, 30% N, 25 % P_2O_5 and 15 % K_2O at fruit set, 20% N, 25 % P_2O_5 and 30 % K_2O at fruit development stage, 10 % P_2O_5 and 30 % K_2O before harvest recorded significantly minimum male flowers (7.54 %), maximum female flowers (92.46%), maximum fruit set (32.20 %), maximum fruit retention (88.86%), maximum fruits per plant (85.60) and yield (26.78 kg/plant).

Keywords: pomegranate, *Ambia bahar*, nutrient scheduling, flowering, fruit set and yield

Introduction
Pomegranate (*Punica granatum* L.) belonging to family *Punicaceae* is drought resistant crop. Nutrient scheduling in pomegranate will provide knowledge of correct time and optimum quantity of fertilizer application at each stage to optimize crop yields with maximum fertilizer use efficiency and at the same time ensuring minimum damage to soil properties. In pomegranate earlier some of the experiments were laid out to find out the optimum dose of fertilizers by Chougule (1976) [1], Shende (1977) [9], Pareek (1982) [5] and Pawar (1998) [6]. But the work on the optimum dose in split through fertigation as per growth stages were not carried out which has immense use of practical utility and need for balanced nutrition and quality yield of pomegranate in future. Hence, in this context, the present investigation was planned to study the effect of nutrient scheduling on flowering, fruit set and yield of pomegranate.

Material and Methods
The research was conducted at Instructional cum Research Orchard Arid Zone Fruits Project, Department of Horticulture, MPKV, Rahuri on 4 year old pomegranate plant orchard in *ambia bahar* during 2015-16 (trial 1) and 2016-17 (trial 2). The pomegranate plants were of cutivar Phule Bhagwa Super. The experiment was conducted in Randomized Block Design and treatments were replicated in three times. The statistical analysis was completed by standard statistical methods suggested by Panse and Sukhatme (1985) [4]. GRDF (625:250:250 NPK g/plant) was split at 4 different stages *viz.*,1. Basal application- in which nutrients were applied through straight fertilizer, 2. Fruit set- in which nutrients were applied through drip (fertigation), 3. Fruit development- in which nutrients were applied through drip (fertigation) 4. Before harvest- in which nutrients were applied through drip (fertigation). GRDF (625:250:250 NPK g/plant) was split according to treatments given in Table 1.

Results and Discussion
Male flowers (%)
The data regarding effect of different treatments on male flowers (%) is presented in table 1. The data of both the trials regarding effect of scheduling of nutrients on male flowers (%) recorded statistically significant differences. In first trial, significantly minimum male

flowers (7.51%) was recorded in T_2 and it was followed by T_6 (8.71 %) and T_1 (9.31 %). Significantly minimum male flowers (7.57%) was recorded in T_2. It was followed by T_6 (8.87 %) and T_4 (9.94 %). Significantly maximum male flowers (11.82 %) was recorded in T_5. In pooled mean data significantly minimum male flowers (7.54%) was recorded in T_2 and it was followed by T_6 (8.79 %) and T_1 (9.69 %). Significantly maximum male flowers (11.67 %) was recorded in T_5.

Female flowers (%)

The data regarding effect of different treatments on female flowers (%) is presented in table 1. The data of both trial regarding the effect of different treatments on female flowers (%) recorded statistically significant differences. Significantly maximum female flowers (92.49 %) was recorded in T_2. It was followed by T_6 (91.29 %) and T_3 (90.74 %). Significantly minimum female flowers (88.48 %) was recorded in T_5. In second trial, significantly maximum female flowers (92.43 %) was recorded in T_2 and it was followed by T_6 (91.13 %) and T_4 (90.06 %). Significantly minimum female flowers (88.18 %) was recorded in T_5.

In pooled mean data, significantly maximum female flowers (92.46 %) were recorded in T_2 and it was followed by T_6 (91.21 %) and T_1 (90.31 %). Significantly minimum female flowers (88.33 %) were recorded in T_5.

Fruit set

The data regarding effect of different treatments on fruit set is presented in table 1. The data of both trial regarding the effect of different treatments on fruit set (%) recorded statistically significant differences. In first trial, significantly maximum fruit set (31.00 %) was recorded in T_2, it was followed by T_1 (28.89 %) and T_3 (28.40 %). Significantly minimum fruit set (23.23 %) was recorded in T_5. In second trial, significantly maximum fruit set (33.39 %) was recorded in T_2. It was followed by T_1 (30.22 %) and T_3 (30.02 %). Significantly minimum fruit set (22.40 %) was recorded in T_4. In pooled mean data, significantly maximum fruit set (32.20 %) was recorded in T_2, it was followed by T_1 (29.56 %) and T_3 (29.21 %). Significantly minimum fruit set (22.82 %) was recorded in T_5.

These results are in accordance with Ramniwas *et al*., (2012) [7] who reported that it might be due to prolonged availability of nutrients during the growth, flowering and fruiting period from fertigation and scheduling over basal application. It might have improved the fruit set. Similar results were also reported by Shankar *et al*., (2002) [8] in guava.

Number of fruits per plant

The data regarding effect of different treatments on number of fruits per plant is presented in table 1. In first trial, significantly maximum number of fruits per plant (84.33) was recorded in T_2 which was at par with T_6 (84.00) and T_3 (83.50). Significantly minimum number of fruits per plant (60.17) was recorded in T_7. In second trial, significantly maximum number of fruits per plant (86.87) was recorded in T_2 which was at par with T_6 (85.85), T_3 (84.00) and T_1 (83.87). Significantly minimum number of fruits per plant (61.40) was recorded in T_7. In pooled mean data, significantly maximum number of fruits per plant (85.60) was recorded in T_2 which was at par with T_6 (84.93), T_3 (83.75) and T_1 (82.69). Significantly minimum number of fruits per plant (60.37) was recorded in T_5.

Yield

The data regarding effect of different treatments on yield (kg/plant) is presented in table 1. The data of both trial regarding the effect of different treatments on yield recorded statistically significant differences. In first trial, significantly maximum yield (25.04) was recorded in T_2. It was followed by T_6 (23.82 kg/plant), T_3 (22.20 kg/plant) and T_1 (22.12 kg/plant). Significantly minimum yield was recorded in T_7 (13.11 kg/plant). In second trial, significantly maximum yield (28.52 kg/plant) was recorded in T_2, it was followed by T_6 (26.37 kg/plant), T_3 (25.40 kg/plant) and T_1 (24.83 kg/plant). Significantly minimum yield was recorded in T_8 (14.25 kg/plant). In pooled mean data, significantly maximum yield (26.78) was recorded in T_2. It was followed by T_6 (25.09 kg/plant), T_3 (23.80 kg/plant) and T_1 (23.48 kg/plant). Significantly minimum yield was recorded in T_7 (13.91 kg/plant). Scheduling of nitrogen and potassium resulted in improved status of nitrogen and potassium in leaves and fruit. Good K nutrition favours the rapid turnover of inorganic nitrogen into proteins and consequently, potassium improves the effect of nitrogen fertilizer. In fact high rates of N can be utilized by the plant and transformed into high yield only in the presence of high K levels (Murray, 1960 and Hewit and Osborne, 1962) [2]. The increase in yield was largely as a consequence of higher hermaphrodite flowers, fruit set, fruit number and fruit weight. Apart from this, nutrient scheduling restricts the fluctuation in nutrient status within narrow range leading to higher yield. These results are in conformity with Khan *et al*., (2013) [3] who reported that different levels of fertigation were found to have profound effect on yield in guava.

Table 1: Treatment details

Sr. No.	Treatments	Stage (Days after 1st irrigation)											
		Basal application (0 days)			Fruit set (60 days)			Fruit development (120 days)			Before harvest (165 days)		
		N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
1)	T_1	25	40	25	30	25	15	30	25	30	15	10	30
2)	T_2	50	40	25	30	25	15	20	25	30	-	10	30
3)	T_3	40	40	25	25	25	15	25	25	30	10	10	30
4)	T_4	10	40	25	40	25	15	40	25	30	10	10	30
5)	T_5	25	40	25	50	25	15	10	25	30	15	10	30
6)	T_6	125	100	50	-	-	-	-	-	-	-	-	-
7)	T_7	50	50	50	25	50	-	25	-	50	-	-	-
8)	T_8	50	100	100	50	-	-	-	-	-	-	-	-

Table 2: Effect of different treatments on flowering, fruit set and yield of pomegranate

Tr. No.	Male flowers (%)			Female flowers (%)			Fruit set (%)			No. of fruits per plant			Yield (kg/plant)		
	Trial 1	Trial 2	Pooled	Trial 1	Trial 2	Pooled	Trial 1	Trial 2	Pooled	Trial 1	Trial 2	Pooled	Trial 1	Trial 2	Pooled
T_1	9.31	10.06	9.69	90.69	89.94	90.31	28.89	30.22	29.56	81.50	83.87	82.69	22.12	24.83	23.48
T_2	7.51	7.57	7.54	92.49	92.43	92.46	31.00	33.39	32.20	84.33	86.87	85.60	25.04	28.52	26.78
T_3	9.26	10.17	9.72	90.74	89.83	90.28	28. 40	30.02	29.21	83.50	84.00	83.75	22.20	25.40	23.80
T_4	9.97	9.94	9.96	90.03	90.06	90.04	23.23	22.40	22.82	60.83	63.43	62.13	13.24	14.40	13.82
T_5	11.52	11.82	11.67	88.48	88.18	88.33	25.26	25.39	25.33	64.67	56.06	60.37	13.76	14.44	14.10
T_6	8.71	8.87	8.79	91.29	91.13	91.21	25.35	25.97	25.66	84.00	85.85	84.93	23.82	26.37	25.09
T_7	9.88	10.74	10.31	90.12	89.26	89.69	24.13	23.73	23.93	60.17	61.40	60.79	13.11	14.71	13.91
T_8	10.34	10.88	10.61	89.66	89.12	89.39	25.65	25.07	25.36	63.00	62.34	62.67	13.75	14.25	14.00
GM	9.56	10.01	9.78	90.44	89.99	90.22	26.49	26.88	26.68	72.75	72.98	72.86	18.38	20.36	19.37
S.E. ±	0.23	0.30	0.26	0.23	0.30	0.26	0.41	0.30	0.36	0.48	2.19	1.58	0.22	0.60	0.45
C.D. at 5%	0.70	0.90	0.77	0.70	0.90	0.77	1.24	0.90	1.04	1.46	6.63	4.59	0.66	1.81	1.30

Conclusion

It has been concluded that scheduling of nutrient *viz.*, 50% N, 40% P_2O_5 and 25% K_2O as a basal application, 30% N, 25 % P_2O_5 and 15 % K_2O at fruit set, 20% N, 25 % P_2O_5 and 30 % K_2O at fruit development stage, 10 % P_2O_5 and 30 % K_2O before harvest proved promising for increasing female flowers, fruit set, fruit retention, number of fruits per plant and yield in pomegranate.

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