

## Original Research Article

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## Response of Pomegranate to Different Organic Manures under Northern Dry Zone of Karnataka, India

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### ABSTRACT

An experiment was conducted to investigate the efficacy of organics on growth behaviour and fruit yield of pomegranate (*Punica granatum* L.) cv. 'Super Bhagwa' under northern dry zone of Karnataka during *hasta bahar* season of 2016-17. The experiment was laid out in a completely randomized block design with seven different sources of nutrients viz., 100% RDN (Recommended dose of nitrogen) through FYM, 100% RDN through vermicompost, 100% RDN through poultry manure, 100% RDN through green manure with sun hemp, 100% RDN through sheep manure, 100% RDN through neem cake and recommended dose of fertilizer (400:200:200 N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O g/plant). Results revealed that 100% RDN through vermicompost recorded significantly highest vegetative growth (number of shoots/plant, shoot length, plant height and plant canopy spread in N-S and E-W) and 100% RDN through poultry manure recorded significantly highest number of productive flowers, fruit set and yield. From the result it can be concluded that 100% RDN through vermicompost and 100% RDN through poultry manure performed best in improving the growth and yield respectively, of pomegranate cv. Super Bhagwa.

#### Keywords

Growth and yield,  
Organic manures,  
Pomegranate, RDN.

#### Article Info

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### Introduction

Pomegranate is an important fruit crop of arid and semi-arid regions of the world. It is believed to be originated from Iran. It has both cultivated (*Punica granatum* L.) and wild types (*Punica protopunica*) and belongs to the family *Lythaceae*. In general, pomegranates are diploids with chromosome number, 2n=2x=16. But, some of them are reported to have 2n=2x=18 chromosomes (Eg. Double Flower, an ornamental variety which bears only flowers). India is one of the leading producers of pomegranate in the world having area over 1.93 lakh ha with annual production 21.98 lakh tones (Anon, 2017). In India, predominantly, pomegranate

is cultivated in vast areas of marginal lands having very low organic carbon content (Marathe *et al.*, 2015) and microbial population where yields were limited due to deficiency of more than 2–3 nutrients (Raghupati and Bhargava, 1998).

Switch over to the organic materials, which are natural source of nutrients, appears an effective alternative. Organic farming, using organic sources like FYM, animal excreta, oil cakes, green manures, crop residues *etc.*, were the only source for supplying nutrients to crops in the past, is slowly regaining its past importance. Organic farming prohibits the use

of synthetic agro-chemicals. It has more relevance to horticultural crops, which are largely consumed in fresh form immediately after harvest, unlike the field crops. Application of organic matter helps in better root growth and proliferation. Improvement in plant growth and nutrient supply (Singh *et al.*, 2010; Sharma *et al.*, 2011; Sudhakar *et al.*, 2002). With the increasing health consciousness, the demand for organically produced pomegranate fruits is growing in Middle East, America and European countries. Keeping these points in mind, the present investigation was therefore, undertaken to study the effect of organic manures on growth and yield of pomegranate cv. Super Bhagwa.

### Materials and Methods

The experiment was conducted in the Orchard of Fruit Science, Sector No.70, University of Horticultural Sciences, Udyanagiri, Navanagar, Bagalkot (Karnataka, India) during *hastha bahar* season of 2016-17. It is situated in the Northern Dry Zone (Zone-3) of Karnataka. The experiment was conducted on three year old pomegranate trees of cv. Super Bhagwa with seven treatments and three replications in completely randomized block design. The total numbers of trees included in the experiment were 84 and were spaced at 3.6 m X 1.8 m.

All the selected trees were almost uniform in growth and vigour. The trees were given uniform cultural operations during the course of investigation. All treatments were applied 15 days before *bahar* treatment except control (RDF) which was applied after *bahar* treatment. Full dose of FYM, vermicompost, poultry manure, green manure (sun hemp), sheep manure, neem cake and RDF were applied as basal dose. Observations on number of shoots, shoot length, plant height and plant canopy spread (N-S and E-W) were

recorded during growth period. The numbers of productive flowers per plant were counted and the average numbers of flowers in each replication were calculated. The fruit set percentage was calculated by using the standard formula (Westwood 1988).

$$\text{Fruit set (\%)} = \frac{\text{Number of fruits}}{\text{Number of productive flowers}} \times 100$$

Statistical analysis was done by using method of analysis of variance (ANOVA) for randomized complete block design (RCBD) by Fischer and Yates (1963). Whenever 'F' test was found significant for comparing the means of two treatments, critical difference (C. D. at 5%) was worked.

### Results and Discussion

100% RDN through vermicompost recorded significantly higher number of shoots (45.73/plant), shoot length (95.30 cm), plant height (3.97 m) and plant canopy spread in both North-South (2.82 m) and East-West (2.98 m) directions (Table 1) and it was followed by 100% RDN through poultry manure. Better growth and development of plants with the application of 100 per cent RDN through vermicompost might be due to increased microbes in the rhizosphere which might have helped in enhanced release of growth factors like auxins, gibberellins and cytokinins in pomegranate (Mir *et al.*, 2015).

These results are also in confirmation with Naik and Babu (2007) who reported that application of vermicompost resulted in highest number of shoots per plant in guava. Choudary (2016) also reported that vermicompost altered various enzymatic activities in plants such as peroxidase, catalase *etc.*, which promotes cell elongation, root and shoot growth and carbohydrate metabolism in ber.

**Table.1** Nutrient status of different organic sources of nutrients

Organic manure	pH	EC (dS <sup>-1</sup> )	OC (%)	N (%)	P <sub>2</sub> O <sub>5</sub> (%)	K <sub>2</sub> O (%)	C:N
FYM	5.40	4.60	24.7	0.7	1.67	0.96	35:01
Vermicompost	7.13	1.83	21.00	1.07	0.91	0.91	21:01
Poultry manure	7.70	1.06	50.00	2.4	4.8	1.08	20:01
Sheep manure	7.60	4.27	23.43	1.1	0.96	0.67	21:01
Neem cake	5.40	4.62	31.43	1.03	0.64	0.87	30:01
Green manure (Sunhemp)	-	-	-	3.21	0.48	0.83	-

**Table.2** Influence of different organic manures on vegetative growth of pomegranate cv. Super Bhagwa

Treatments	Number of shoots	Shoot length (cm)	Plant height (m)	Plant spread (m)	
				North-South	East-West
T <sub>1</sub> -100%RDN- FYM	34.30	82.30	3.23	2.43	2.48
T <sub>2</sub> -100% RDN-VC	45.73	95.30	3.97	2.82	2.98
T <sub>3</sub> -100% RDN-PM	39.93	88.18	3.49	2.67	2.67
T <sub>4</sub> -100% RDN-GM	37.60	85.33	3.50	2.57	2.66
T <sub>5</sub> -100% RDN-SM	36.57	84.97	3.25	2.31	2.60
T <sub>6</sub> -100% RDN-NC	36.27	79.84	3.00	2.28	2.58
T <sub>7</sub> . control (RDF-400:200:200 g/plant)	35.43	83.43	3.29	2.43	2.67
S Em ±	1.42	2.78	0.17	0.10	0.08
CD at 5 %	4.36	8.57	0.53	0.31	0.25

FYM-Farm yard manure; VC-Vermicompost; PM- Poultry manure; GM- Green manure (sum hemp); SM-Sheep manure; NC- Neem cake; RDF- Recommended dose of fertilizers; RDN- Recommended dose of nitrogen

**Table.3** Influence of different organic manures on number of productive flowers, fruit set and yield of pomegranate cv. Super Bhagwa

Treatments	Productive flowers per plant	Fruit set (%)	Yield (kg/plant)	Yield (t/ha)
T <sub>1</sub> .100% RDN- FYM	67.78	63.90	11.61	18.00
T <sub>2</sub> .100% RDN-VC	63.00	52.55	9.00	13.89
T <sub>3</sub> .100% RDN-PM	85.15	67.16	13.43	20.73
T <sub>4</sub> .100% RDN-GM	69.18	58.83	10.24	15.80
T <sub>5</sub> .100% RDN-SM	66.21	66.91	10.79	16.65
T <sub>6</sub> .100% RDN-NC	76.11	66.19	12.72	19.65
T <sub>7</sub> . control (RDF-400:200:200 g/plant)	75.55	63.92	12.09	18.66
S Em ±	4.26	2.41	0.39	0.60
CD at 5 %	13.13	7.42	1.22	1.84

FYM-Farm yard manure; VC-Vermicompost; PM- Poultry manure; GM- Green manure (sum hemp); SM-Sheep manure; NC- Neem cake; RDF- Recommended dose of fertilizers; RDN- Recommended dose of nitrogen

Significantly higher number of productive flowers (85.15 plant<sup>-1</sup>) and highest fruit set (67.16 %) were recorded by the plants supplied with 100% RDN through poultry manure (Table 3). The fruit set in pomegranate depends on number of hermaphrodite flowers (Anon., 2011). Phosphorous is a vital nutrient involved in stimulating and enhancing bud development, blooming and fruit set. Highest phosphorous content in poultry manure might help the plants to produce more flowers and fruits. In the present investigation, lowest numbers of flowers were recorded in 100% RDN through vermicompost. Significantly higher yield of 13.43 kg/plant and 20.73 t/ha was recorded in plants supplied with 100% RDN through poultry manure and it was at par with 100% RDN through neem cake (Table 2). In poultry manure and neem cake treatments, increase in yield was 9.98% and 5.08%, higher than control (RDF), respectively. More number of productive flowers and higher fruit set helped in increased yield under this treatment. These results corroborated with Marathe *et al.*, (2017) who reported that, nutrients in organic manures were released slowly and made available throughout the growth period and resulted in better uptake of nutrients, plant vigour and yield of the plants in pomegranate. Lowest yield of 9.00 kg/plant and 13.89 t/ha was recorded with the application of 100% RDN through vermicompost. Lesser number of productive flowers and lesser fruit set percentage might have resulted in reduced number of fruits and yield in this treatment.

The results of the present investigation revealed that the nutritional requirement of pomegranate could be fulfilled with the exclusive use of organic sources without affecting growth performance and yield. It can be concluded that poultry manure could be harnessed for effective organic production of pomegranate. Thus, there is a need to address some key issues for enhancing

pomegranate productivity in northern dry zone of Karnataka; recommendations include intensification of effort by extension workers to convince farmers of the advantage of using organic manures. Also organic manures should be made readily available to farmers at affordable prices.

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