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Effect of Organic and Inorganic Fertilizers on Yield of Pomegranate (*Punica granatum* L.) under Precision Farming

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ABSTRACT: The present study includes the effect of organic and inorganic fertilizers on growth and quality of pomegranate (*Punica granatum* L.) under precision farming was carried out at during the year 2020 – 2021 at PFDC (Precision Farming Development Centre), Department of fruit science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya Raipur. The two to three year old pomegranate tree cv. Super Bhagwa were selected. The experiment was laid out in a Randomized Block Design with 10 treatments and three replications of each. The maximum yield parameter *viz*., fruit weight (g), fruit volume (cc), number of fruit per plant, weight of fruit per plant (kg), weight of aril per fruit (g) and peel weight per fruit (g) was recorded under the treatment T_9 - 80% of RDF + Vermiwash + Cow urine through drip (1 litre/week) was significantly highest. During the course of experimental work, infestation of diseases and insect-pest was observed by the application of organic and inorganic fertilizers which was readily managed.

Keywords: Cowurine, vermiwash, organic fertilizer, inorganic fertilizer and pomegranate.

INTRODUCTION

Pomegranate (*Punica granatum* L.) is also known as 'super food' for its nutritional and health benefits. It is one of the major fruit crops of arid and semi-arid regions. The pomegranate boasts a number of distinctive and noteworthy qualities. It has a broad range of adaptation, relatively low cultivation costs, a tolerance for drought, significant economic returns and a high potential for export, therefore recently it has been reported to have a larger area. Additionally, due to its broader industrial applicability, it is becoming more and more popular on the global market (Aviram and Dornfeld 2001).

The popular table fruit, Pomegranate (*Punica granatum* L.) is well-liked for its reviving juice, which has a significant medical potential. Pomegranate production is profitable due to the fruit's hardiness, cheap maintenance requirements, high harvests, higher keeping quality and ability to survive without irrigation. The pomegranate, which is a member of the Punicaceae and Lythraceae families, is a favourite table fruit in tropical and subtropical areas. *Punica protopunica* and *Punica granatum* L., both of the cultivated species, are present. The fruit originated in Iran, where cultivation began around 2000 B.C. Pomegranates are often diploid, with chromosome numbers 2n = 2x=16, and 18.

Pomegranate is regarded as a fruit that is healthy. Sixty eight percent of this fruit is edible. It is 78% water, 1.6% protein, 14.5% carbohydrate, 10 mg calcium per 100g, 70 mg phosphorus per 100g, 3 mg iron, 10 mg riboflavin, and 16 mg vitamin C per 100g fruit. The fruit is primarily utilised in desserts. High-quality fresh fruits are available, and processed foods like bottled juice, syrup, and jelly are well-liked. Leprosy patients are said to benefit from drinking this juice. The juice can be utilised to make wine and is simple to ferment. Citric acid and sodium citrate are made from the juice of wild pomegranates for therapeutic purposes. Additionally, it is used to treat diarrhoea and dysentery. The therapy of chronic gastric disease is the most well-known (Sudhakar and Murthy 2015).

It is a resilient fruit crop that can thrive even on poor soils. Production methods for pomegranates are under intense scrutiny due to their perennial nature, cumulative nutrient treatments and variable reactions to inputs. The plants' health is declining as a result of its rigorous cropping practises, which include bahar treatment (plant hormone manipulation of flowering and fruit setting), without sufficient nutrient management. This leaves the plants vulnerable to various biotic and abiotic challenges (NRCP, 2011).

Iran, India, Turkey, Spain, Tunisia, Morocco, Afghanistan, China, Greece, Japan, and other nations produce pomegranates. Pomegranates of high quality are grown in Turkey, Iran, Afghanistan, Syria, Morocco, and Spain. Pomegranates are grown on 275 thousand hectares of land in India, where 3256

thousand MT are produced each year (Anon., 2020). Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Madhya Pradesh, Tamil Nadu and Rajasthan are among the Indian states that grow pomegranates. It covers 850 hectares in Chhattisgarh and produces 5714 MT (Anon, 2020). Nasik, Sangli, Solapur, Satara, Ahmednagar, Buldhana, Beed, Aurangabad, and Washim are major pomegranate-producing regions in Maharashtra. It is primarily growing in Bijapur, Bellary, Koppal, Bagalkot, etc. in Karnataka. Pomegranate is a drought-resistant crop. It is advantageous to use drip irrigation because the cracking of the fruit is reduced due to the lower water pressure. Drip irrigation technology has become a potential alternative for the survival and growth of fruit crops under arid and semi-arid conditions. In addition to saving water (30 to 50%). Due to frequent irrigation, the salt concentration is maintained within the allowable range near the root zone, which improves the growth and nutritional status of pomegranate plants in soils affected by salt (Jerome and Dwivedi 2022). The system also checks for transport losses through leakage and evaporation (Gao *et al*., 2019; Pampattiwar *et al*., 1993).

MATERIALS AND METHODS

In the year 2020 - 2021, the experiment was carried out in the PFDC at the Department of Fruit Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya Raipur. On a two to three year old pomegranate tree of the variety Super Bhagwa, the experiment was carried out using a Randomised block design with ten treatments and three replications. Ninety trees in all, spaced 2 metres apart, were a part of the experiment.

Fertilizer doses applied during the month of October Nitrogen, phosphorus and potassium were applied through urea, Di-ammonium phosphate and Murat of potash, respectively for T_0 soil application. Recommended doses of N, P_2O_5 and K_2O used were 250g N, 100g P_2O_5 and 250g K_2O per plant respectively. Half dose of Urea and full dose of D.A.P. & M.O.P. were applied in soil application and remaining half dose of urea applied at fruit setting stage. The fertilizers for the treatment T_1 to T_9 were applied by water soluble fertilizer (19: 19: 19), recommended doses of N, P_2O_5 and K_2O used were 250g N, 100g P_2O_5 and 250g K_2O per plant respectively and other inorganic fertilizer in combined treatment be used. Statistical analysis was done by using method of analysis of variance (ANOVA) for randomized block design (RBD) 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.

Application of fertilizer dosages in October For T_0 soil application, nitrogen, phosphorus, and potassium were added using urea, di-ammonium phosphate, and muriate of potash, (250g N, 100g P_2O_5, and 250g K_2O) per plant were the recommended doses for N, P_2O_5, and K_2O, respectively. Half of the urea was administered at the soil application, together with the full doses of D.A.P. and M.O.P. The remaining half of the urea was applied during the fruit setting stage. The recommended amounts of N, P_2O_5, and K_2O employed were 250g N, 100g P_2O_5, and 250g K_2O per plant, respectively, and other inorganic fertilizer in combined treatment be used. The fertilizers for the treatments T_1 to T_9 were applied *viz*., water soluble fertilizer (19: 19: 19). Statistical analysis was performed utilising method of analysis of variance (ANOVA) for randomized block design (RBD) by Fischer and Yates (1963).

Treatment combinations:

T_0 (100% of RDF as soil application and irrigation through drip)

T_1(60% RDF through drip), T_2 (80% RDF through drip)

T_3 (100% RDF through drip)

T_4(60% of RDF + Vermiwash through drip (1 litre/ week)

T_5 (80% of RDF + Vermiwash through drip (1 litre/ week)

T_6(60% of RDF + Cow urine through drip (1 litre/ week)

T_7(80% of RDF + Cow urine through drip (1 litre/ week)

T_8(60% of RDF + Vermiwash + Cow urine through drip (1 litre/ week)

T_9(80% of RDF + Vermiwash + Cow urine through drip (1 litre/ week))

RESULT

The data Table 1 revealed that, the fruit weight (250.41 g) was significantly increased by application of treatment T_9 (80 per cent RDF+ Vermiwash + Cow urine through drip (1 litre/ week) at par with the treatments, T_8 (60 per cent RDF Vermiwash + Cow urine through drip (1 litre/ week) i.e. 241.73g. T_7 (80% R.D.F.+ Cow urine through drip (1 litre/week) i.e. 230.65g. Similar results were found by Hamounda *et al.* (2016). This result is in close conformity with the earlier finding by Jadhav*et al.* (2018) fruit weight ranged 175.38 to 215.82 g.

The data revealed that, the fruit volume (220.52cc) was significantly increased by application of treatment T_9 (80 per cent RDF+ Vermiwash + Cow urine through drip (1 litre/ week) at par with the treatments, T_8 (60 per cent RDF Vermiwash + Cow urine through drip (1 litre/week) i.e. 213.42cc.Similar results were found by Shanmugasundaram and Balakrishnamurth (2015) fruit volume is 228.75 cc. This result is in close conformity with the earlier finding by Jadav *et al.* (2018).

The data revealed that, the No. of fruit/plant (11.66) was significantly increased by application of treatment T_9 (80 per cent RDF+ Vermiwash + Cow urine through drip (1 litre/week) at par with the treatments, T_8 (60 per cent RDF Vermiwash + Cow urine through drip (1 litre/week) i.e. 10.66. Similar results were found by Dutta Ray *et al.* (2014).

The data Table 2 revealed that, the weight of fruit/plant (2.75kg) was significantly increased by application of treatment T_9 (80 per cent RDF+ Vermiwash + Cow urine through drip (1 litre/week) at par with the treatments, T_8 (60 per cent RDF Vermiwash + Cow urine through drip (1 litre/ week) i.e. 2.46kg, T_7 (80%

R.D.F.+ Cow urine through drip (1 litre/ week) i.e. 2.41kg. Similar results were found by Jadhav *et al.* (2018). This result is in close conformity with the earlier finding by Kurer *et al*. (2017).

Table 1: Effect of organic and inorganic fertilizes on yield attributes of Pomegranate cv. Super Bhagwa.

Treatments	Fruit weight (g)	Fruit volume (cc)	Number of fruit/ plant
100% of RDF as soil application and irrigation through drip (Control) **T_0**	160.31	102.48	4.33
60% of RDF through drip **T_1**	188.27	111.64	5.33
80% of RDF through drip **T_2**	193.18	143.53	6.66
100% of RDF through drip **T_3**	197.58	158.66	5.66
60% of RDF + Vermiwash through drip (1 litre/ week) **T_4**	192.54	176.41	7.66
80% of RDF + Vermiwash through drip (1 litre/ week) **T_5**	210.41	189.33	8.33
60% of RDF + Cow urine through drip (1 litre/ week) **T_6**	211.69	203.53	8.66
80% of RDF + Cow urine through drip (1 litre/ week) **T_7**	230.65	211.51	10.33
60% of RDF + Vermiwash + Cow urine through drip (1 litre/ week) **T_8**	241.73	213.42	10.66
80% of RDF + Vermiwash + Cow urine through drip (1 litre/ week) **T_9**	250.41	220.52	11.66
SEm±	**1.00**	**0.93**	**1.87**
CD at 5%	**3.00**	**2.79**	**5.52**

The data revealed that, the weight of aril / fruit (136.18g) was significantly increased by application of treatment T_9 (80 per cent RDF+ Vermiwash + Cow urine through drip (1 litre/ week) at par with the treatments, T_8 (60 per cent RDF Vermiwash + Cow urine through drip (1 litre/ week) i.e.128.03g, T_7 (80% R.D.F.+ Cow urine through drip (1 litre/ week) i.125.23g. Similar results were found by Jadav (2018) The data revealed that, the treatment, T_4 (75 per cent RDF through fertigation) registered the highest arils weight (144.73 g) and showed at par with T_5 (100 per cent RDF through fertigation) i.e. 140.55 g. The lowest arils weight (95.01 g) was recorded in control T1 (Surface irrigation + R.D.F.).

The data revealed that, the peel weight / fruit (113.92g) was significantly increased by application of treatment T_9 (80 per cent RDF+ Vermiwash + Cow urine through drip (1 litre/ week) at par with the treatments, T_8 (60 per cent RDF Vermiwash + Cow urine through drip (1 litre/ week) i.e. 113.20g, T_7 (80% R.D.F.+ Cow urine through drip (1 litre/ week) i.e. 104.92g. Similar results were found by Hasani *et al.* (2012). This result is in close conformity with the earlier finding by Kurer *et al.* (2017) An experiment was conducted to investigate the efficacy of organics on fruit yield of pomegranate (*Punica granatum* L.) cv. Super Bhagwa under northern dry zone of Karnataka. From the result it can be concluded that 100% RDN through vermicompost and 100% RDN through poultry manure performed best in improving the yield of pomegranate cv. Super Bhagwa.

Table 2: Effect of organic and inorganic fertilizes on yield attributes of Pomegranate cv. Super Bhagwa.

Treatments	Weight of fruit/plant (kg)	Weight of aril/fruit (g)	Peel weight/fruit (g)
100% of RDF as soil application and irrigation through drip (Control) **T_0**	0.70	100.20	60.11
60% of RDF through drip **T_1**	1.03	118.32	70.63
80% of RDF through drip **T_2**	1.19	101.03	91.98
100% of RDF through drip **T_3**	1.16	103.05	94.18
60% of RDF + Vermiwash through drip (1 litre/ week) **T_4**	1.40	105.16	92.07
80% of RDF + Vermiwash through drip (1 litre/ week) **T_5**	1.78	108.13	102.28
60% of RDF + Cow urine through drip (1 litre/ week) **T_6**	1.84	108.45	103.53
80% of RDF + Cow urine through drip (1 litre/ week) **T_7**	2.41	125.23	104.92
60% of RDF + Vermiwash + Cow urine through drip (1 litre/ week) **T_8**	2.46	128.03	113.20
80% of RDF + Vermiwash + Cow urine through drip (1 litre/ week) **T_9**	2.75	136.18	113.92
SEm±	**1.82**	**1.82**	**1.82**
CD at 5%	**5.39**	**5.39**	**5.38**

CONCLUSIONS

According to the findings of the current study, only organic sources could satisfy the nutritional needs of pomegranates without compromising yield characteristics. The yield parameter was shown to be better affected by the organic and inorganic fertilizer treatments T_9 - 80% of RDF + Vermiwash + Cow urine by drip (1 litre/week). The best way to increase the yield parameter for pomegranate fruits, including fruit weight (g), fruit volume (cc), number of fruit per plant, weight of fruit per plant (kg), weight of aril per fruit (g) and peel weight per fruit (g), was to apply 80% of the recommended dose of fertilizer using water soluble fertilizer + Vermiwash + cow urine.

FUTURE SCOPE

Pomegranate fruit reaction to similar treatments varies among species and cultivars and physiological status of fruit. Hence, the experiment should be carried out on other fruit cultivars for growth, yield and quality demand in the industry. Organic fertilizers continue to improve the soil for a long time after the plants have absorbed the nutrients they need.

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