ISSN: 2347-4688, Vol. 11, No.(2) 2023, pg. 534-540

Current Agriculture Research Journal

www.agriculturejournal.org

Effectiveness of Foliar Applications of Plant Extracts on Pomegranate Plantlets

CHANGDEV DHANAJI CHAVAN[1]*, DILIP DAMODAR KURLAPKAR[2] and DATTATRAY KRUSHNA GAIKWAD[3]

[1]Department of Botany, Shivaji University, Kolhapur.
[2]Former Principal, Kai. S .B. Khade Mahavidyalaya, Koparde.
[3]Dr. Babasaheb Ambedkar Marathwad University sub campus near MIDC, Osmanabad.

Abstract

An attempt was taken to control initial growth of pomegranate plantlets by application of plant extracts as foliar spray under field circumstances. A modified preparation of 'Dashparni extract', was developed using leaf extracts of *Vitex negundo, Aristolochia sp., Carica papaya, Tinospora cordifolia, Annona squamosa, Pongamia pinnata, Ricinus communis, Nerium indicum, Calotropis procera,* Green chilli paste, Garlic paste applied to regulate growth and development of pomegranate saplings. The Dashaparni extract proved to be more effective than all other tests conducted as well as control (distilled water spray). The extract boosted overall growth of plantlets and disease resistance.

Article History
Received: 06 May 2023
Accepted: 14 August 2023

Keywords
Dashparni Plant Extracts;
In-Vivo;
Pomegranate;
Plantlets.

Introduction

Pomegranate is a table fruit crop and popularly known as 'Fruit of Paradise' of the world. It was originated in the parts of Iran, and cultivated since prehistoric times throughout the Asiatic Mediterranean region and northern India. It is belongs to the family Punicaceae has two different species viz. *Punica granatum* L. (cultivated) also wild type *Punica protopunica* Balf. (author name missing). India is well known as the topmost with the others pomegranate producing countries globally having area more than 1.93 lac ha with yearly production 21.98 lac tones.[1] In Indian province it is largely propagated in huge zones of secondary lands having little content of OC[2] and microorganism incidence where harvests are limited caused by inadequacy of nutrients.[3] The most effective alternative to overcome the situation is the organic fertilizers, fulfil the need of nutrients. Organic farming, includes use of organic material like FYM, cattle dung, press cakes, green manuring, crop remains etc., serves as supplementary nutrients to crops from old times, have resumed their previous importance. Application of harmful synthetic chemicals are avoided in organic farming. It is more

CONTACT Changdev Dhanaji Chavan changdevd8085@gmail.com Department of Botany, Shivaji University, Kolhapur.

Doi: https://dx.doi.org/10.12944/CARJ.11.2.14

relatable with the horticultural products which are directly consumed as fresh in comparison with other agro products. Application of organic supplements is helpful in better growth of plants as the consequence of increased root proliferation. Enhancement in plant growth and nutrient provision.[456] With the increasing health cognizance, the demand for organic pomegranate fruits is rising in Middle East, America and European countries. Keeping these facts in mind, the current study was aimed to study the influence of organic manures on growth and harvest of pomegranate cv. Bhagwa, recorded during growth progression. The effect of organic fertigation on number of fertile flowers as well as percentage of fruit setting was also verified. It will helpful to design applied model for organic production of pomegranate and empowerment of farmers in drought prone regions.

Material and Methods

Collection of Plant Samples as Source of Extract

Visit in Solapur district for the survey of Pomegranate orchards and brought some plantlets for further experimental studies. The required plant parts for 'Dashparni Extract' *viz*., leaves of *Vitex negundo, Aristolochia sp*., *Carica papaya*, *Tinospora cordifolia, Annona squamosa, Pongamia pinnata, Ricinus communis, Nerium indicum, Calotropis procera, Capsicum annuum* fruit (Green chilli) paste, *Allium sativum* (Garlic) paste etc. were collected from various localities of Solapur district and taken to the laboratory for the preparation of extracts.

Preparation of Plant Extracts

The aqueous extracts were prepared for the experimental purpose. The leaves of different plants were cleaned with tap water and dried in sunlight. Selected plants material (100gm each) was homogenized by using a mortar with pestle and extracted in 100 ml sterile distilled water, then filtered through muslin cloth. The filtrate was centrifuged at 1200 RPM for 10 minutes. The equivalent quantity of *Azadirachta indica, Vitex negundo leaves, Aristolochia sp. leaves, Carica papaya, Tinospora cordifolia* leaves*, Annona squamosa leaves, Pongamia pinnata leaves, Ricinus communis leaves, Nerium indicum, Calotropis procera leaves, Capsicum annuum* fruit (Green chilli) paste, *Allium sativum* (Garlic) paste (1:1:1:1:1:1:1:1:1:1) were used to prepared aqueous 'Dashparni extract'. The supernatant was taken as a stock solution. The plant extracts of 7% concentration were made by adding sterile distilled Water.[8]

***In-vivo* Experiment**

In-vivo studies were conducted in the pomegranate orchard at Natepute Dist. Solapur, beginning of Mrig bahar (June-2022) for the evaluation of plant extracts to pomegranate plantlet growth. Pomegranate Bhagwa variety plantlets were so arranged as each treatment had three replications in a Complete Randomized Block Design.[7] The experiment was arranged with two different treatments e.g. a) Dashaparni Extract b) Recommended fertilizer dose. The recommended dose of fertilizers for pomegranate 400:200:200 g NPK per plant was applied during the period of experiment. The employed recommended doses of NPK were in represented by urea, diammonium phosphate and muriate of potash. Selected triplicate experimental set were treated by spray to monitor effect on plantlets growth. Freshly prepared Dashparni Extract was applied as foliar spray. The sprayings with 15 days interval were carried out on selected plantlets of pomegranate.

Growth attributes such as number of shoots, shoot length and plant height were recorded through growing period. The numbers of fertile flowers per plant were assessed and in each replication, the average numbers of flowers were calculated. The percentage of fruit set was assessed by using the standard formula.[9]

Statistical Analysis

Analysis of variance (ANOVA) was used for randomized complete block design (RCBD). 10 Whenever 'F' test was found significant for comparing the means of two treatments, critical difference (C. D. at 5%) was worked.

Result and Discussion

The nutrient status of organic sources is denoted in Table 1. The comparative Effect of Recommended dose and other treatments are recorded in Table 2. Results had shown considerably greater shoot number (45.73/plant), length of shoot (95.30 cm), height of plant (3.97 m) and plant canopy cover in both North-South (2.82 m) and East-West (2.98 m) directions and it was followed by 100%

RDN (Recommended Dose of Nitrogen) through manure (Plate 1, Fig.1, 2, 3 and 4) The enhancement in growth and development of plants with the use of 100 percent RDN through vermicompost may be consequent to amplified number of microbes in the rhizosphere which might helped in enriched release of plant growth regulators like auxins, gibberellins and cytokinins in pomegranate.[11]

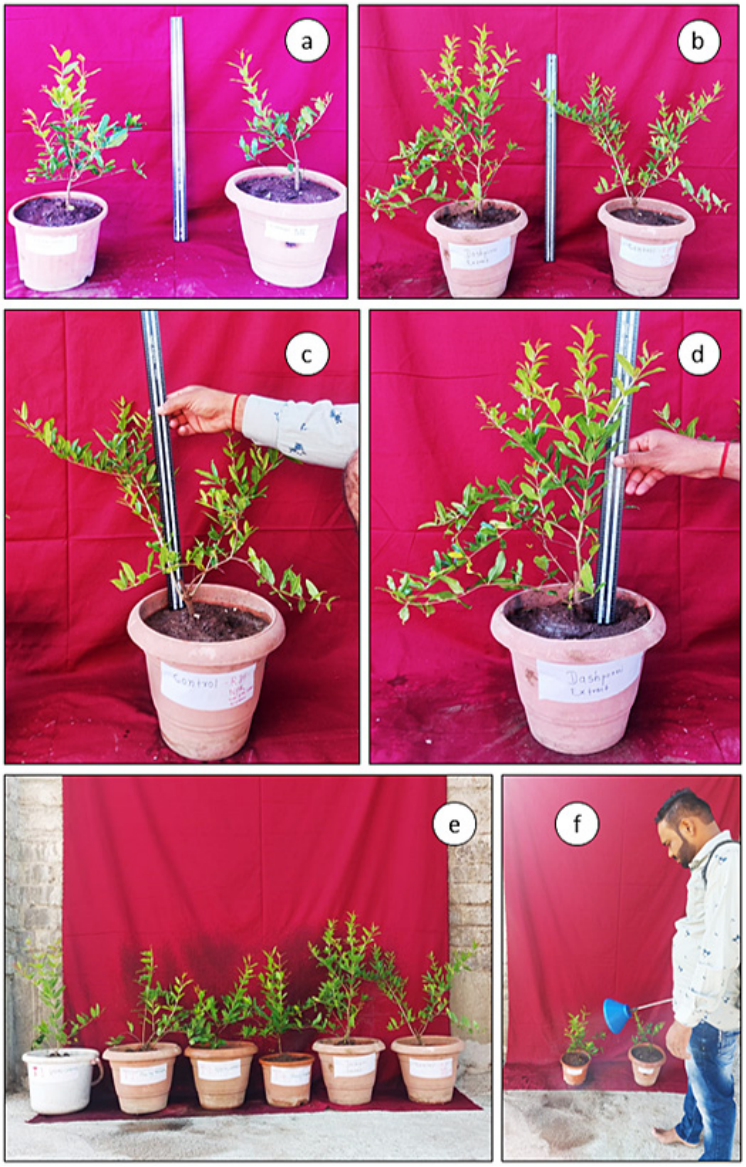

Plate 1: Effect of different fertigation on pomegranate plantlets
a: Plantlets before treatment
b: Plantlets after treatment
c: Control- plantlet treated with chemical fertilizer
d: Plantlet treated with Dashaparni Extract
e: Plantlets treated with different fertigation
f: While application of fertilizer

Table 1: Nutrient status of different organic sources of nutrients

Type of Fertigation	pH	EC (dS-1)	OC (%)	N (%)	P2O5 (%)	K2O (%)	C:N
Recommended Fertilizer Dose	4.56	3.89	25	1	1.21	0.89	34:02
Dashparni Extract	-	-	-	4.11	0.58	0.93	-

Table 2: Effect of various organic manures on vegetative growth of pomegranate cv. Super Bhagwa

Treatment No.	Dose	Number of shoots	Shoot length (cm)	Plant height (m)	Plant spread (m)	
					East-West	North-South
1	Vermi Compost	38.73	85.3	2.6	2.68	2.89
2	Poultry Manure	39.13	87.98	2.49	2.79	2.76
3	Neem Cake	36.85	80.48	2.03	2.28	2.58
4	Sheep Manure	36.57	83.97	2.25	2.31	2.6
3	Dashparni Extract	39.58	89.72	2.5	2.87	2.96
control	(RDF-400:200:200 g/plant)	36.34	82.94	2.21	2.39	2.59

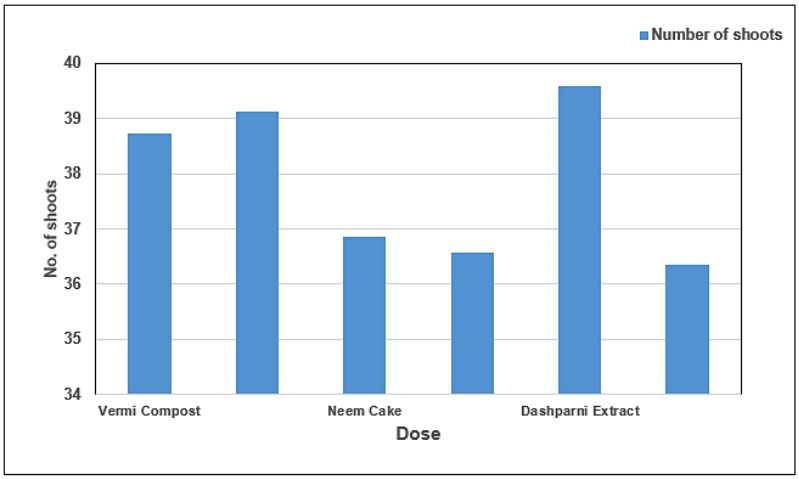

Fig. 1: Effect of various organic fertilizer treatments on shoot number of pomegranate cv. Super Bhagwa

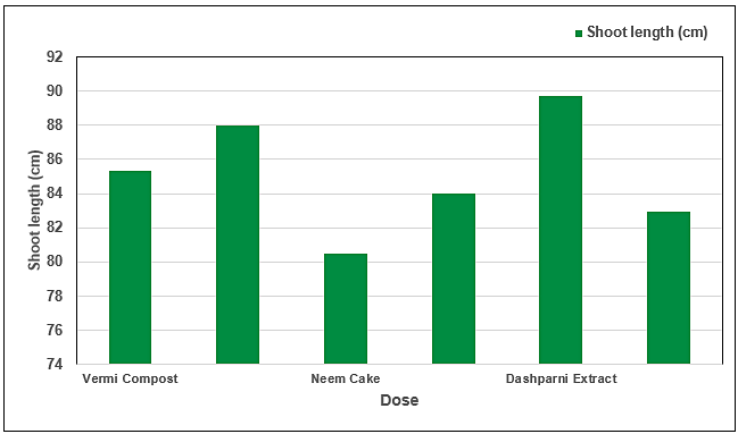

Fig. 2: Effect of various organic fertilizer treatments on shoot length of pomegranate cv. Super Bhagwa

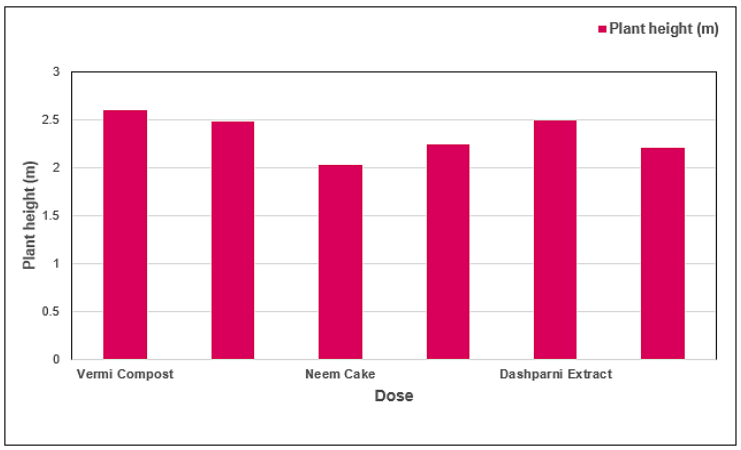

Fig. 3: Effect of various organic fertilizer treatments on height of pomegranate cv. Super Bhagwa

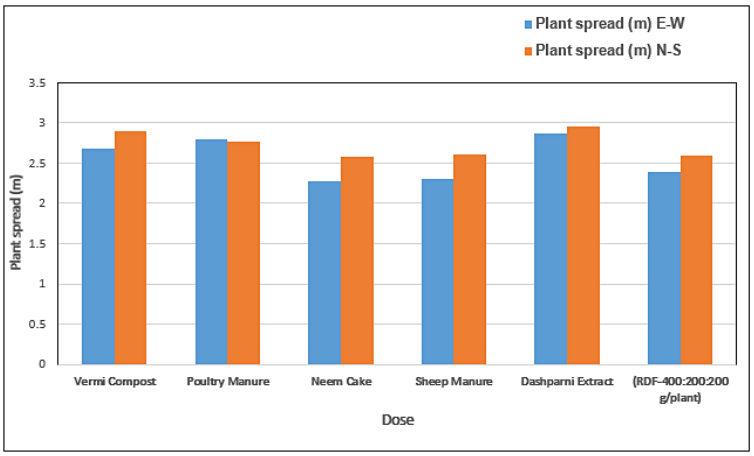

Fig. 4: Effect of various organic fertilizer treatments on plant spread of pomegranate cv. Super Bhagwa

These results are also confirmed with[12] in which report of largest number of shoots per plant in guava as result of vermicompost application.[13] also reported improved activities of various enzymes in plants such as peroxidase, catalase *etc*., due to vermicompost which stimulated cell elongation, root and shoot growth and carbohydrate metabolism in ber.

The results of the present research shown that the nutrients' necessity of pomegranate could be fulfilled with the use of organic sources with no effect on plant vigor and yield. It can be concluded that poultry manure proved for more considerable organic pomegranate production, similar result were detected.[14] Thus, there is a need to discourse some main factors for improvement in yield and quality. Pomegranate production in drought prone zone of Maharashtra especially in Solapur district; suggestions includes convincing farmers for the advantage of using Dashparni extract, as the agro-extension activity. Also the efforts should be taken for easy availability of Dashparni extract to farmers at reasonable prices.

Utilization of plant extract is an innovative tactic that showed promising results in controlling certain diseases including wheat leaf rust with environment friendly approach.[15] The aqueous extract of *Azadirachta indica* leaves was found more effective against the groundnut rust caused by *Puccinia*.[16,17] reported that, neem formulation PJMC was effective in rust management of French-bean caused by *Uromyces appendiculatus.* There is a great prospect for utilization of various plant extracts for plant growth. Therefore, an experiment was conducted to assess the growth of pomegranate plants using different plant extracts under field conditions.

Thus from the current experimentation, it is concluded that application of Dashparni extract proved greater over the other treatments in terms of enhancement in main factors contributing towards the better biochemical factors and quality parameters in Mrig bahar pomegranate cv. Bhagwa in Solapur region.

Acknowledgement

The authors would like to thank Prof. Dr. R. V. Gurav, Head Department of Botany, Shivaji University, Kolhapur for providing laboratory facilities. First author Mr. Changdev Dhanaji Chavan is very much grateful to the Chhatrapati Shahu Maharaj Research, Training and Human Development Institute (SARTHI), Pune, Maharashtra state of India for providing financial support as Ph.D. stipend.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

The authors do not have any conflict of interest.

References

1. Anonymous 2017. All India second advance estimates of area and production of horticulture crops, 31st May.
2. Marathe, R. A. and Babu, D. K., 2015. Determination of sampling period and leaf position for critical nutrient analysis in pomegranate cv. *Bhagwa. Indian J. Hortic.,* 72: 562–565.
3. Raghupathi, H. B. and Bhargavaa, B. S., 1998 Leaf and soil nutrient diagnostic norms for pomegranate (*Punica granatum* L.). Comm. in Soil Sci. and Plant Anal., 29: 19-20.
4. Singh, S. R., Zargar, M. Y., Singh, U. and Ishaq, M. 2010 Influence of bio-inoculants and inorganic fertilizers on yield, nutrient balance, microbial dynamics and quality of strawberry (*Fragaria x ananassa*) under rained conditions of Kashmir valley. *Indian J. Agrl. Sci.*, 80: 275–281.
5. Sharma, S. D., Devi, M., Kumar, P., Bhardwaj, S. K. and Raj, H., 2011. Potential use of bio-organic and inorganic nutrient source dynamics for improving cropping behavior, soil biological properties, nutrient content and quality attributes of apricot *(Prunus armeniaca L.).* Comm. in Soil Sci. and Plant Anal., 42: 1659–1674.
6. Sudhakar, G., Cristopher, A. L. and Rangaswamy, A., 2002 Effect of vermicompost application on the soil properties, nutrient

availability, uptake and yield of rice-a review. *Agri. Review,* 23: 127–133.

7. Kirankumar K.H, Shivakumara B.S, Suresha D. Ekabote, Madaiah D. and Sarvjna B Salimath 2018. Effect of integrated nutrient management on quality and biochemical parameters of pomegranate cv. Bhagwa under central dry zone of Karnataka. *International Journal of Chemical Studies;* 6(1): 05-06.
8. Kamble, S. K. and Patil B. J. 2019. Efficacy of foliar spray applications of plant extracts against groundnut rust. *Current Research in Environmental & Applied Mycology* 9 (1), 113–121.
9. Westwood, M. N., 1993. Temperate Zone Pomology. Portland, OR: Timber Press.
10. Fischer, R. R. and Yates, F. 1963. Stastical tables for biological, agricultural and medical research. Sixth edition, Oliver and Boyd, Tweedale Court, Edinberg, pp. 747-777.
11. Mir, M., Sharma, S. D. and Kumar, P., 2015. Nutrient dynamics: effect on cropping behavior, nutrient profile and quality attributes of pomegranate (*Punica granatum* l.) under rainfed agro climatic conditions. *J. Plant Nutr.,* 38:83–95.
12. Naik, M. H. and Babu, R. S. H., 2007. Feasibility of organic farming in guava *(Psidium guajava L.). Acta Hort.*, 735: 365-372.
13. Choudhary R. 2016. Effect of organic manures and fertility levels on growth parameters of ber (*Zizyphus mauritiana Lamk.*) cv. Gola under semi-arid conditions. M.Sc., thesis submitted to Department of Horticulture S. K. N. College of agriculture, Jobner; S. K. N. Agriculture University Jobner– 303 329.
14. Kurer B., Patil D., Gandolkar K., Raghavendra K. Mesta, Nagaraj M.S., Nadaf A.M. and Prakash D.P. 2017. Response of Pomegranate to Different Organic Manures under Northern Dry Zone of Karnataka, India *Int.J.Curr.Microbiol.App.Sci* 6(11): 86-90.
15. Joseph T.S, Sharia B.P.1999. Medicinal plants in pest control. *Indian Journal Arecanut, Spices and Medicinal plants* 1:123–124.
16. Ghewande M.P. 1989. Management of foliar diseases of groundnut *(Arachis hypogaea)* using plant extracts. *Indian Journal of Agricultural Sciences* 59:133–144.
17. Singh A.K, Narayana B.M. 2002. Control of French bean rust through fungicides and a neem based formulation. *Indian Phytopathology* 55(2):241–243.