Asian Journal of Agricultural and Horticultural Research

Volume 11, Issue 2, Page 22-31, 2024; Article no.AJAHR.114459
ISSN: 2581-4478

Effect of Cattle Urine and Humic Acid on Growth of Nutmeg Grafts

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Authors' contributions

This work was carried out in collaboration among all authors. Authors PPD, MSG, PCH and PMH did the conceptualization of research. Authors PPD and MSG designed the experiment. Author PCH contributed to the experiments. Authors PPD and HPN executed the field/lab experiments and collected the data. Authors PPD, HPN and MSG did data interpretation. Authors PPD and HPN prepared the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAHR/2024/v11i2310

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/114459

Original Research Article

Received: 11/01/2024
Accepted: 15/03/2024
Published: 20/03/2024

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ABSTRACT

The experiment was conducted at AICRP Oil Palm, College of Horticulture, Mulde, Sindhudurg under Dr. B. S. K. K. V. Dapoli, during the year 2020-2023 to assess the Effect of Cattle urine and humic acid spray sprays on growth of nutmeg grafts. The experiment was laid out in Randomized Block Design with three replications with eight different treatments of foliar application, cattle urine spray at (15% ,25%), and Humic acid spray at (0.4) and drenching, cattle urine drench at (15%, 25%), Humic acid drench at (0.2, 0.6), and Control (No spray), are applied on nutmeg grafts after 45 days of grafting up to 135 days and different growth parameter observation were recorded up to highest survival and saleable percentages. The best results was obtained from treatment T-7 (0.4% Humic acid spray) record significantly highest survival (95%), saleable percent (97.67%) along with highest height (15.85cm), girth (24.21mm), number of leaves (24.21), leaf length (15.85cm), leaf area **(**44.35cm^2**)** and tap root in T-7 length (20.60cm).The highest cost benefit ratio were recorded significantly highest in T-7 hence for the excellent growth of nutmeg grafts in Konkan region of Maharashtra 0.4% humic acid spray is recommended.

Keywords: Nutmeg grafts; foliar spray; drenching; humic acid.

1. INTRODUCTION

Nutmeg (*Myristica fragrance* Houtt.) is one of the popular spice crop which belongs to family Myristicaceae (Periasamy et al., 2016).which is a small group comprising 16 genera and about 380 species. It is an important tree spice which produces two different spices namely nutmeg and mace. It is mainly distributed to the low land tropical forests of the world. Nepal, Bhutan, Grenada, Sri Lanka, Malaysia, Indonesia and Guatemala are major nutmeg growing regions.

Guatemala is world's largest producers of Nutmeg (24,000 MT) which contributes 32.44 per cent of the world's total production. In India, it has occupied an area of about 23478 ha [1] with an annual production of 15.24 MT [2]. Dried kernel of nutmeg is known for its aromatic properties (Tajuddin et al., 2003). Kerala is the leading state in area and production followed by Karnataka and Andhra Pradesh (www.nhb.gov.in) It is grown in Kerala, Tamil Nadu, Karnataka, Assam, Andhra Pradesh, Konkan region in Maharashtra and Goa. The female nutmeg tree starts fruiting from sixth years, till the peak period is reached after 20 years.

As nutmeg trees are dioecious in nature and propagated both sexually (seed) as well as asexually (cutting or grafting). The sexual propagation tree yields 50% male seedlings, which are unproductive. For identification of male and female plants there is no reliable method for early sex detection before flowering hence grafting is the preferred. Softwood grafting, approach grafting and patch budding have proved successful methods of propagation with higher success. Air layering is also used but has low (35-40%) success. Though softwood grafting is commercially adopted method of propagation. The growth of the grafts is slow and hence percent survival is low. To hasten the growth at nursery stage it is indispensable to use exogenous nutrient sprays or to enrich soil media. organic nutrient sprays proved beneficial to hasten the growth in most of crops at nursery stage hence it is inescapable to test the role of organic nutrients like cow urine, humic acid, in hastening the growth of nutmeg grafts. Sawant *et al.,* (2020). Humic ingredients comprise three types of organic acid; humin, humic acid and fulvic acid. They have been well-defined in humic science in harmony with their solubility features [3].

As the growth of the nutmeg graft is very slow and it takes more than to attain saleable stage. The success of the experiment will give healthy, vigorous and sturdy saleable nutmeg graft at early stage in nursery.

2. MATERIALS AND METHODS

The experiment was laid out in nursery at AICRP Oil Palm, College of Horticulture, Mulde the uniformly grown grafts were selected at 45 days after grafting for the experiment along with 8 treatment, three replication along with Randomized block design .The experiment was imitated during 2019 and completed during 2023. There is a rising attention in the use of Humic acid as organic manures or soil tonic. Soft wood grafts of nutmeg grown in 6"×8" size polybags of 3 months old were used for the experimental

purpose. A unit of 50 grafts was replicated 3 times to forms replications. The treatments are as T_1 (15% cattle urine drench), T_2 (25% cattle urine drench) ,T_3 (15% cattle urine spray), T_4 25 % cattle urine spray) T_5 (0.2% Humic acid drench) T_6 (0.6% Humic acid drench),T_7 0.4% (Humic acid spray), T_8 **(**Control –No spray) .The recommended cultural practices (Irrigation, weeding and plant protection, etc.) were followed uniformly to experimental plots. The Spraying with different organic nutrient sprays During the period the application of six foliar spray as well as drenching of the nutrient take at the interval of 15 days up to 135 days after grafting were take place and all growth parameters were recorded up to the salable stage i.e.,270 days was done at 45 days interval up to 360 days. The observations were recorded randomly selected five plants from each replication treatment wise. Statistical analysis of the data was carried out by standard method of analysis of variance as given by Panse and Sukhatme (1995).

3. REÙLTS AND DISCUSSION

Regarding the growth parameter data from Table 1 revealed that there was non-significant effect of nutrient on height, girth and number of leaves at initial stage. while Height at 90 days, 180 days and 270 days was found to be significantly the highest (20.13 cm ,25.06 cm and 31.10 cm respectively) in T-7.Similarly, the girth at 90 days, 180 days and 270 days were found significantly highest in T-7 (3.48 mm, 4.41 mm and 5.62 mm) respectively. At 180 days the higest girth were recorded in T-2 (4.25 mm) which was at par girth with T-7. Also, the number of leaves at 90 days, 180 days and 270 days was found to be significantly highest in T-7 (11, 16, 24.78 respectively).

The growth parameter from Table 2 it revealed that he leaf length at 90 days T-3 recorded the highest leaf length (10.04 cm) and at 180 days and 270 days T-7 recorded highest leaf length in T-7 (13.51cm) and (15.85 cm) respectively. Leaf area at 90 days, 180 days, 270 days recorded significantly the highest value in T-7 (22.54 cm^2, 36.46 $cm^2$and 44.35 cm^2) Shiva et al., (2015)studied that Humic acid has three types of effect (Physical, Chemical, and Biological) on soil and plants, physical effect; enhance water holding capability, increase ventilation of soil, improve soil workability, assist in drought resistance, make soil further friable or crumbly and reduce soil corrosion. Chemical effect; chelates nutrients for endorsement by plants, holds high ion-exchange ability and rises buffering traits of soils. Nitrogen level is increase in the soil and biological effect, hastens plant cell division, stimulates growth, increase germination of seed and viability .The root length at initial stage was not significant and at 270 days it recorded its maximum value in T-7 (24.21 cm). Khaled et al. [4] reported that humic acids are beneficial in freeing up nutrients in the soil so that they are become available to the plant as needed. Quilty [5] studied as the humic acid molecules are small, which “allows them to reach the plant plasma membrane, where they effectively influence the assimilation of nutrients”. Sinha et al., (2011) recorded during his study on humic acid also accumulates toxic heavy metals very efficiently. Meganid et al. [6] found that the humic acid can enhance nutrient availability and improve chemical, biological, and physical soil properties. Hamideh et al [7] recorded that salt stress had reducing effects on the amounts of Fv/Fm whereas the application oh humic acid and fulvic acid, especially the first one, had promoting effects and the negative effects of salt stress were significantly alleviated by the applied humic substances.

Regarding the survival and seleable % the data revealed from Table 3, the highest percentage of saleable grafts at 90 days, 180 days and 270 days significantly recorded the highest values in T-7 (51.67%, 70.17% and 95%) respectively. Eisa et al. [8] Abd El-Razek et al. [9] found that use of humic acid as a soil application improve nutrient availability especially microelements in sandy soils because it promotes nutrient uptake in the form of chelating agent. Moreover, humic substances may increase root growth in a similar manner to auxins. O’Donnell, [10] In addition, the humic acid has many effects as it raises of cation exchange capacity which affects the retention and availability of nutrients, as well as due to a hormonal effect, or a combination of both [11] as a result, it can be used to solve many problems in soils such as soil nutrient availability and chemical reactions that affect the loss or fixation of almost all nutrients. Generally, there is a growing interest of the use of humic acid and K-humate as a substitute to chemical fertilizers which have potential polluting effects in the environment [12].

The highest survival percentage grafts at 90 days, 180 days and 270 days significantly recorded the highest values in T-7 (100%, 99.33 % and 97.67%) respectively. In addition, the highest C: B ratio were recorded in T-7 (1: 1.89).

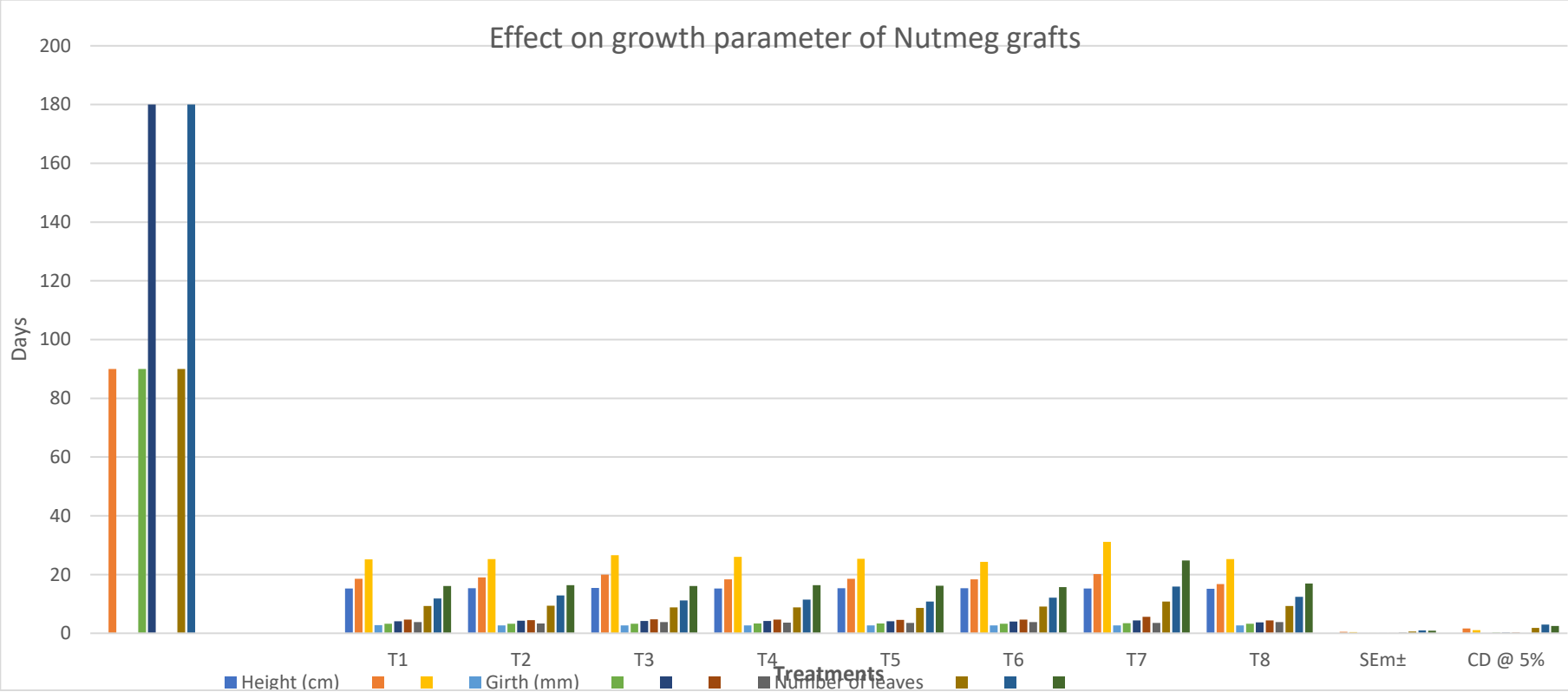

Fig. 1. Growth parameter height, girth, number of leaves of nutmeg grafts

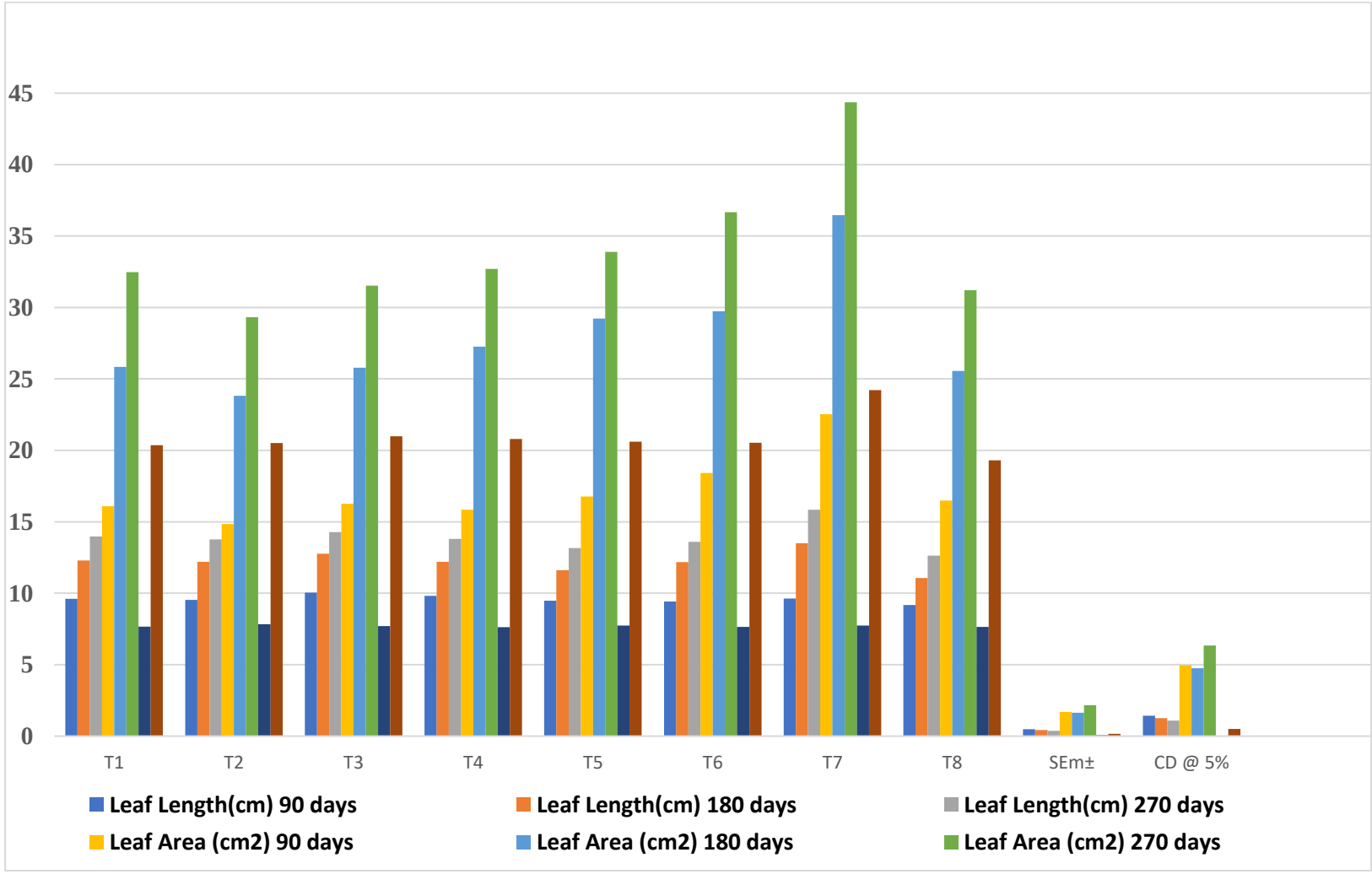

Fig. 2. Growth parameter leaf length, leaf area, Tap root length of nutmeg grafts

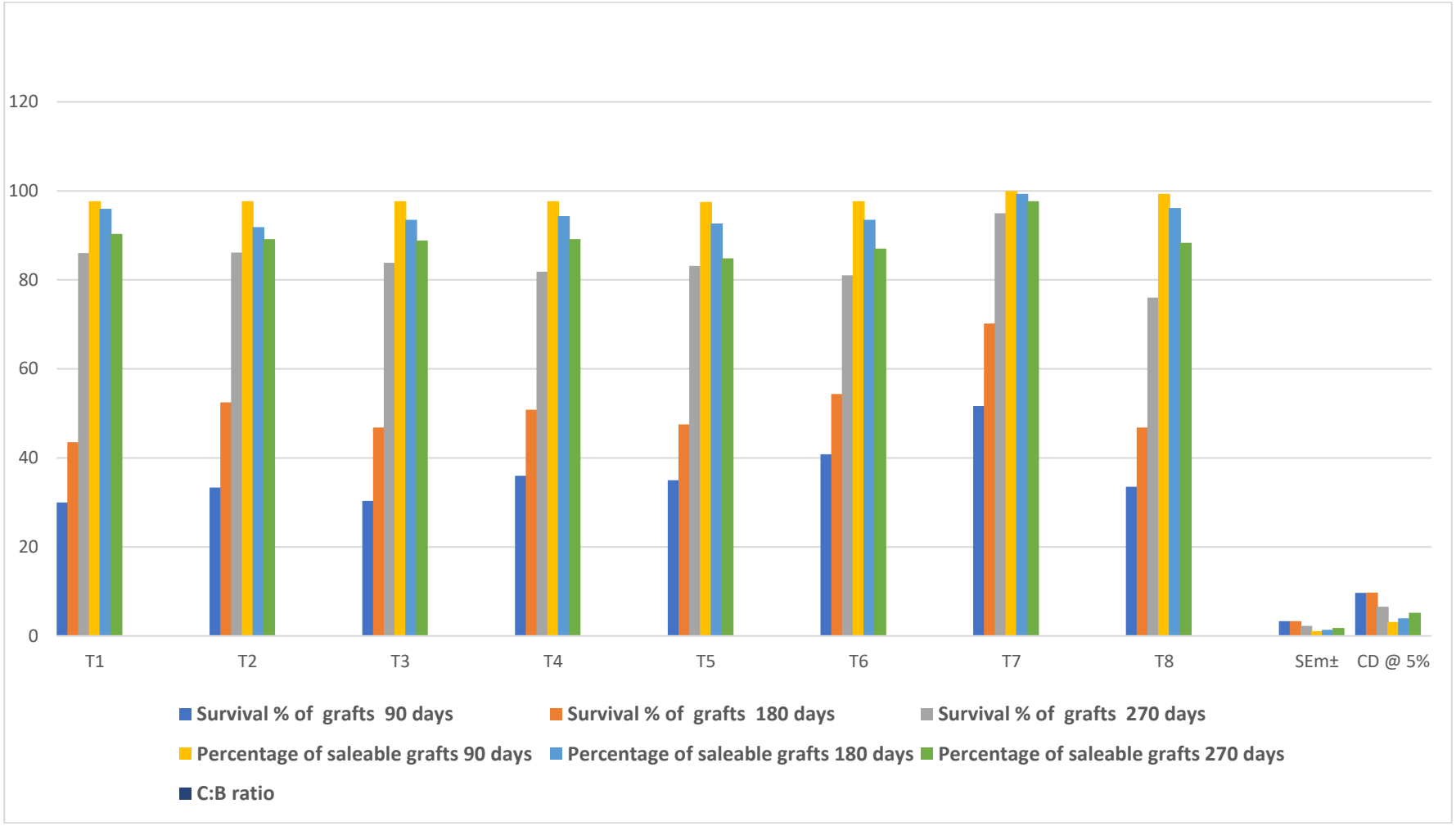

Fig. 3. Survival, Saleable percent and cost benefit ratio of nutmeg graft

Table 1. Growth parameter height, girth, number of leaves of nutmeg grafts

Treatment		Height (cm)				Girth (mm)				Number of leaves			
		Initial	90 days	180 days	270 days	Initial	90 days	180 days	270 days	Initial	90 days	180 days	270 days
T_1	15% cattle urine drench	15.25	18.55	21.98	25.13	2.73	3.26	4.13	4.71	3.78	9.33	11.87	16.05
T_2	25% cattle urine drench	15.33	19.01	22.17	25.22	2.70	3.28	4.25	4.51	3.33	9.37	12.87	16.42
T_3	15% cattle urine spray	15.43	19.93	22.90	26.54	2.70	3.27	4.23	4.74	3.78	8.80	11.20	16.07
T_4	25% cattle urine spray	15.29	18.41	21.59	25.98	2.66	3.34	4.18	4.71	3.67	8.83	11.47	16.42
T_5	0.2% Humic acid drench	15.31	18.53	21.53	25.39	2.65	3.34	4.12	4.56	3.56	8.60	10.77	16.22
T_6	0.6% Humic acid drench	15.31	18.32	21.95	24.32	2.71	3.28	3.96	4.64	3.78	9.10	12.17	15.75
T_7	0.4% Humic acid spray	15.29	20.13	25.06	31.10	2.70	3.48	4.41	5.62	3.56	10.8	15.90	24.78
T_8	Control –No spray	15.17	16.80	19.96	25.25	2.67	3.26	3.73	4.40	3.78	9.33	12.43	16.97
SEm±		0.09	0.55	0.73	0.37	0.02	0.06	0.08	0.08	0.19	0.62	1.02	0.85
CD @ 5%		NS	1.60	2.13	1.09	NS	0.19	0.26	0.23	NS	1.80	2.98	2.49

Table 2. Growth parameter leaf length, leaf area, tap root length of nutmeg grafts

Treatment		Leaf Length(cm)			Leaf Area (cm^2)			Tap root length (cm)	
		90 days	180 days	270 days	90 days	180 days	270 days	Initial stage	270 days
T_1	15% cattle urine drench	9.61	12.30	13.98	16.10	25.84	32.47	7.66	20.36
T_2	25 % cattle urine drench	9.54	12.20	13.76	14.85	23.81	29.31	7.83	20.52
T_3	15% cattle urine spray	10.04	12.77	14.27	16.26	25.78	31.53	7.70	20.98
T_4	25 % cattle urine spray	9.81	12.20	13.81	15.85	27.25	32.70	7.63	20.79
T_5	0.2% Humic acid drench	9.47	11.62	13.16	16.78	29.23	33.89	7.73	20.60
T_6	0.6 % Humic acid drench	9.43	12.18	13.60	18.42	29.73	36.67	7.64	20.54
T_7	0.4% Humic acid spray	9.63	13.51	15.85	22.54	36.46	44.35	7.73	24.21
T_8	Control –No spray	9.17	11.06	12.64	16.49	25.55	31.21	7.64	19.30
SEm±		0.49	0.43	0.37	1.70	1.63	2.17	0.07	0.17
CD @ 5%		1.43	1.26	1.09	4.97	4.76	6.34	NS	0.51

Table 3. Survival percentage, saleable percentage and Cost benefit ratio of nutmeg grafts

Treatment		Survival % of grafts			Percentage of saleable grafts			C:B ratio
		90 days	180 days	270 days	90 days	180 days	270 days	
T_1	15% cattle urine drench	30.00 (33.16)*	43.50 (41.26)*	86.00 (68.24)*	97.67 (82.98)*	96.00 (80.58)*	90.33 (71.99)*	1:1.36
T_2	25% cattle urine drench	33.33 (35.22)*	52.50 (46.44)*	86.17 (68.23)*	97.67 (82.98)*	91.83 (73.44)*	89.17 (70.81)*	1:1.34
T_3	15% cattle urine spray	30.33 (33.31)*	46.83 (43.18)*	83.83 (66.42)*	97.67 (82.98)*	93.50 (75.28)*	88.83 (70.49)*	1:1.37
T_4	25% cattle urine spray	36.00 (36.87)*	50.83 (45.48)*	81.83 (64.98)*	97.67 (82.98)*	94.33 (76.27)*	89.17 (70.81)*	1:1.35
T_5	0.2% Humic acid drench	35.00 (36.15)*	47.50 (43.57)*	83.17 (66.06)*	97.50 (82.66)*	92.67 (74.63)*	84.83 (67.10)*	1:1.36
T_6	0.6% Humic acid drench	40.83 (39.52)*	54.33 (47.51)*	81.00 (64.27)*	97.67 (82.98)*	93.50 (75.28)*	87.00 (68.94)*	1:1.31
T_7	0.4% Humic acid spray	51.67 (45.95)*	70.17 (56.99)*	95.00 (77.08)*	100.00 (90)*	99.33 (87.29)*	97.67 (82.98)*	1:1.45
T_8	Control –No spray	33.50 (35.16)*	46.83 (43.28)*	76.00 (61.06)*	99.33 (87.29)*	96.16 (78.81)*	88.33 (70.69)*	1:1.32
SEm±		3.30	3.34	2.24	1.07	1.35	1.78	
CD @ 5%		9.65	9.76	6.55	3.125	3.95	5.22	

Treatments **Application of treatments** **90 days**

180 days **270 days** **270 days**

Fig. 4. Experimental trail view at different interval of days

4. CONCLUSION

It is concluded that the treatment T-7 (0.4 % Humic Acid Spray) recorded significant superior among all other treatments resulting in the highest height, girth, number of leaves, leaf length, leaf area, root length, survival percentage and saleable grafts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
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