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MV Patel

Department of Fruit Science
 ASPEE College of Horticulture
 and Forestry, NAU, Navsari,
 Gujarat, India

BR Parmar

Department of Fruit Science
 ASPEE College of Horticulture
 and Forestry, NAU, Navsari,
 Gujarat, India

AP Halpati

Department of Fruit Science
 ASPEE College of Horticulture
 and Forestry, NAU, Navsari,
 Gujarat, India

AB Parmar

Department of Fruit Science
 ASPEE College of Horticulture
 and Forestry, NAU, Navsari,
 Gujarat, India

AK Pandey

Department of Fruit Science
 ASPEE College of Horticulture
 and Forestry, NAU, Navsari,
 Gujarat, India

Correspondence

MV Patel

Department of Fruit Science
 ASPEE College of Horticulture
 and Forestry, NAU, Navsari,
 Gujarat, India

Effect of growing media and foliar spray of organics on seedling growth and vigour of acid lime

MV Patel, BR Parmar, AP Halpati, AB Parmar and AK Pandey

Abstract

The present experiment was conducted during the year 2016-17 at Regional Horticulture Research Station, Navsari Agricultural University, Navsari. The experimental results indicated that media (M₃) red soil + FYM + vermicompost (1:1:1) noted greater germination percentage (82.11%), height of seedling at 120, 150 and 180 DAS (29.38 cm, 38.53 cm and 47.00 cm, respectively), number of leaves (22.48, 30.29 and 36.34, respectively) and stem diameter (2.10 mm, 2.70 mm and 3.12 mm, respectively). Whereas, the maximum fresh (17.67 g) and dry weight (10.06 g) of seedling, vigour index- I (3859.66) and II (826.02), highest survival percentage (75.26%) and least mortality percentage (24.73%) was noted in (M₃) red soil + FYM + vermicompost (1:1:1) at 180 DAS. Among the foliar spray treatment, (F₄) *panchagavya* @ 3% was significantly improved growth parameter *viz.*, height of seedling at 120, 150 and 180 DAS (29.64 cm, 38.30 cm and 47.32 cm, respectively), number of leaves (22.22, 30.69 and 36.31, respectively) and stem diameter (2.10 mm, 2.73 mm and 3.12 mm, respectively). Likewise the highest fresh (17.97 g) and dry weight (10.02 g) of seedling, vigour index- I (3681.89) and II (778.31), highest survival percentage (75.20%) and least mortality percentage (24.82%) was noted in same foliar spray at 180 DAS. The interaction effect between the media and foliar spray had a significant effect only on height of seedling at 150 and 180 DAS as well as number of leaves at 150 DAS. The maximum height of seedling (42.87 cm) at 150 DAS and 51.90 cm at 180 DAS as well as the highest number of leaves (35.07) at 150 DAS was recorded in treatment (M₃F₄) red soil + FYM + vermicompost (1:1:1) and *Panchagavya* @ 3%.

Keywords: Acid lime, media, organic foliar spray, growth and vigour

Introduction

Citrus is one of the most important fruit crop of tropical and subtropical regions. It is a native to India and South Eastern China. It occupies 3rd rank after mango and banana in India. Citrus is a member of the family rutaceae, subfamily aurantioideae. Small fruited acid limes are classified botanically under *Citrus aurantifolia* Swingle (L.).

Citrus crop is grown all over the world. In India acid lime is cultivated in 2.59 lakh ha with annual production of 27.89 lakh MT. Major citrus growing states are Andhra Pradesh, Maharashtra, Gujarat, Bihar, Karnataka, and Tamil Nadu. In Gujarat, area under acid lime cultivation is about 0.42 lakh ha with annual production of 4.62 MT. In Gujarat, leading acid lime growing districts are Mahesana, Kheda, Anand, Vadodara and Surendranagar (Anon., 2017) ^[1].

Lime or acid lime is also commercially known as 'Patti lime' or 'Kagzi lime'. It occupies the highest commercial importance of all the available types of limes and lemons. It is also used for preparing of important products made from lime *viz.*, lime juice, lime cordial, lime oil, dried or dehydrated lime peel, lime powder and pickle, jams, jellies, marmalades, flavoring jams and alcoholic/non-alcoholic drinks. It is a good source of edible citric acid and essential ingredient of almost all the herbal cosmetics. Acid lime is a good source of Vitamin-C (62.9 mg/100 ml), Vitamin- B₁, Vitamin- B₂, minerals like Calcium (90 mg/100 ml), Phosphorus (20 mg/100 ml), Iron (0.3 mg/100 ml) and other nutritive substances which are required for human health.

Growing media play an important role in germination of seed and for further growth and development of seedling. It is a substrate that provides the required elements and physical support to the growing plants. Media should also have good water holding capacity, drainage and other physical and chemical properties. Foliar feeding is a way of supplementing the

nutrients quickly and specifically and also for stimulation of plant metabolism. Foliar fertilization has been used as a means of supplying supplemental doses of major and minor nutrients, plant hormones, stimulants and other beneficial substances. The plant nutrients which are absorbed through roots can also be absorbed with equal efficacy through foliage (Del, 1971) [4].

Materials and Method

The present investigation entitled "Effect of growing media and foliar spray of organics on seedling growth and vigour of acid lime" was conducted at Regional Horticulture Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2016-17. The experiment was arranged in a net house over eighteen treatment combinations comprising of three levels of growing media (M₁-Red soil, M₂- Red soil + FYM (1:1) and M₃- Red soil + FYM + Vermicompost (1:1:1) and six levels of organic foliar spray (F₁- Cow Urine (3%), F₂- Amritpani (3%), F₃- Novel (1%), F₄- Panchagavya (3%), F₅- Vermiwash (10%) and F₆- Control) laid out in Completely Randomized Design (CRD) with factorial concept with three repetitions. The foliar spray was done at 60 and 90 days after sowing. The data on germination percentage were recorded at 30 DAS. While, height of seedling (cm), number of leaves per plant, stem diameter (mm) were recorded at 120, 150 and 180 days after sowing. In respect of fresh and dry weight of seedling, survival percentage and mortality percentage, vigour index- I and vigour index- II were recorded at 180 days after sowing in acid lime.

Results and Discussion

Effect of media on germination percentage

Among different media the highest germination percentage (82.11%) was found (Table 1) in media (M₃) red soil + FYM + vermicompost (1:1:1) it might be due to beneficial response of media combination enhance biological, physical and chemical properties of growing media. Red soil facilitated natural support to plant. FYM containing organic manures possess organic acid. Therefore, more available moisture and some acids may have assist in better germination percentage and minimum days to germination. Vermicompost as a source of organic manure contribute better nutrition to the germinating seedlings (Hartmann and Kester, 1997) [6]. The similar results were also reported by Srinivasulu *et al.* (2015) [11] in sour orange.

Table 1: Effect of growing media on germination percentage of acid lime

Media	Germination (%)
M ₁ : Red soil	71.88
M ₂ : Red soil + FYM (1:1)	78.22
M ₃ : Red soil + FYM + Vermicompost (1:1:1)	82.11

Effect of media on Growth parameters

Growing media showed (Table 2) significant effect on growth attributes in acid lime. The topmost plant height of acid lime seedling (29.38 cm, 38.53 cm and 47.00 cm) at 120, 150 and 180 DAS, respectively was recorded in (M₃) red soil + FYM + vermicompost (1:1:1) media, which might be attributed to the conducive effect of this media composition on water holding capacity, porosity, soil aeration and supplying substantial amount of nutrient specially nitrogen and micro nutrients for good plant growth (Chopde *et al.* 1999) [3]. Increase in number of leaves might be mainly due to

corresponding increase in plant height (Govind and Chandra, 1993) [5] and maximum number of leaves per seedling at 120, 150 and 180 DAS (22.48, 30.29 and 36.34 cm, respectively), stem diameter (2.10, 2.70 and 3.12 mm, respectively) was recorded in (M₃) red soil + FYM + vermicompost (1:1:1) media, it may be due to better nutrient availability leading to immense production of photosynthetically functional leaves in these treatments finally resulting in better girth of seedling. The leaves of seedling raised in this media (M₃) also has higher leaf chlorophyll content due to presence of nitrogen in vermicompost and FYM which might certainly upgrade the photosynthetic rate, dry matter production and their by more fresh and dry weight of plant (Awasthi *et al.*, 1996) [2]. Combination of media also helped enhanced soil permeability, air flow, improved soil porosity, drainage and also FYM and vermicompost had a positive effect on root development. This is helpful in realizing greatest survival percentage and least mortality of seedlings. Higher vigour index- I (3859.66) and vigour index- II (826.02) was found in media (M₃) presented in (Fig.1), this might be due to increased germination and seedling height which have contributed to greater vigour index- I and vigour index-II. The results of study are in close agreement with the findings of Prajapati *et al.* (2017) [9] acid lime, Parasana *et al.* (2013) [8] in mango.

Effect of organic foliar spray on Growth parameters

Organic foliar spray showed (Table 2) the significant effect on growth parameters in acid lime. Acid lime plant treated with foliar spray of *panchagavya* @ 3% (F₄) noted maximum height of seedling at 120, 150 and 180 DAS (29.64 cm, 38.30 cm and 47.32 cm, respectively), number of leaves per seedling (22.22, 30.69 and 36.31, respectively), stem diameter (2.10 mm, 2.73 mm and 3.12 mm, respectively) while fresh weight of seedling (17.97 g), dry weight of seedling (10.02 g), vigour index- I (3681.89) and vigour index- II (778.31) was found in same foliar spray at 180 DAS, it might be due to *panchagavya* contain growth regulatory substances such as IAA, GA, Cytokinins are an increase in the plant growth due to the growth regulators could be attributed to an increase in the meristematic activity of apical tissues. Growth regulators are involved in encourage photosynthetic activity, efficient translocation and utilization of photosynthates causing rapid cell elongation and cell division at growing region of the plant leading to stimulation of growth, besides increasing the uptake of nutrients. The gibberellic acid enhance the plant height is mainly due to cell elongation increase in size and rapid cell division. Due to the elongation of internodes will take place, hence the seedling height, number of leaf will increase. Which might have indirectly exhibited by enhanced growth parameter in acid lime. Least mortality percentage and higher survival percentage because presence of essential plant nutrients (macro and micro), beneficial microorganisms growth promoting factors, enzymes, antioxidant properties in *panchagavya*. The findings of this experiment are in close conformity of Kumar *et al.* (2014) [7] in mango. Other finding of *panchagavya* relate to growth of plant, Shakila and Anburani, (2008) [10] in tomato.

Interaction effect of growing media and organics foliar spray

The interaction effect (Table.3) between the media and foliar spray had a significant effect only on height of seedling at 150 and 180 DAS as well as number of leaves at 150 DAS. The maximum height of seedling (42.87 cm) at 150 DAS and

(51.90 cm) at 180 DAS as well as the highest number of leaves (35.07) at 150 DAS was recorded in treatment (M3F4)

red soil + FYM + vermicompost (1:1:1) and *panchagavya* @ 3%.

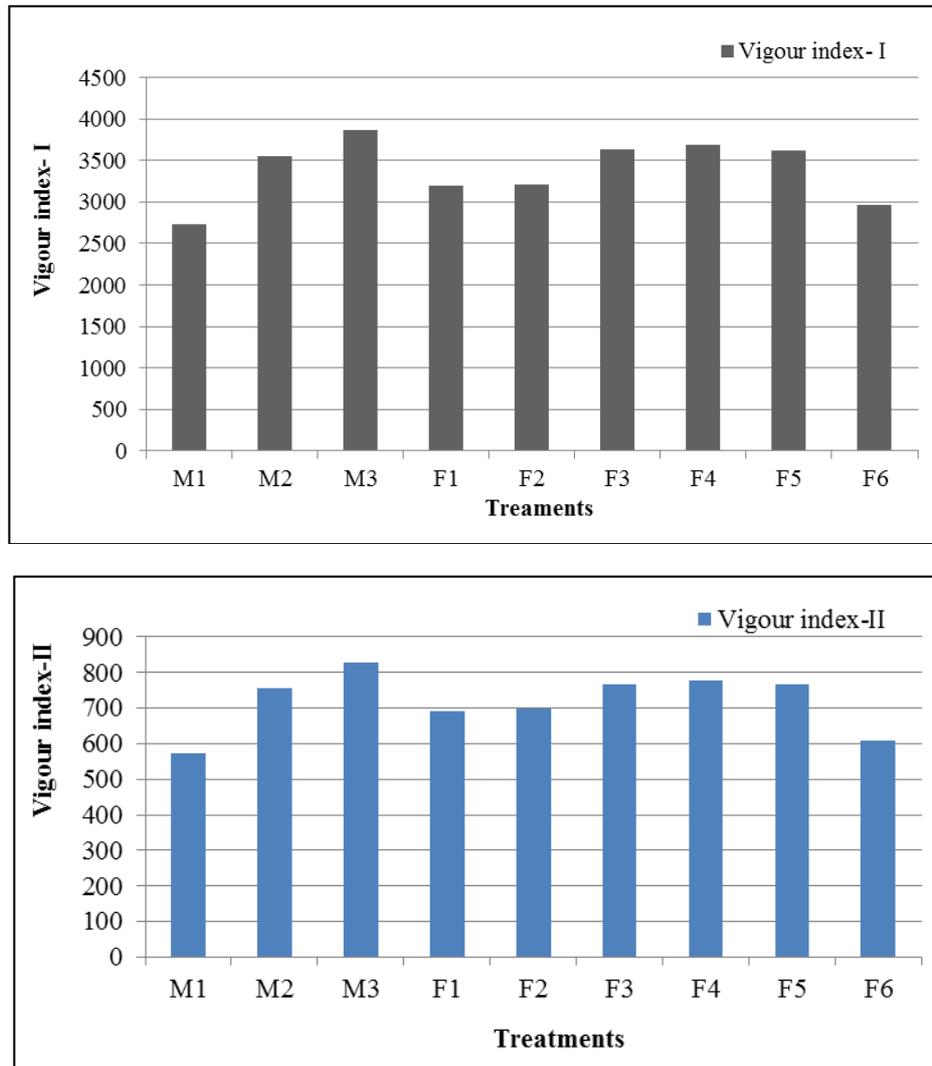


Fig 1: Effect of growing media and foliar spray of organics on seedling vigour index-I and II in acid lime

Table 2: Effect of growing media and foliar spray of organics on seedling growth and vigour of acid lime

Treatments	Height of seedlings (cm)			Number of leaves			Stem diameter (mm)			Fresh weight of seedling (g)	Dry weight of seedling (g)	Survival (%)	Mortality (%)
	120 DAS	150 DAS	180 DAS	120 DAS	150 DAS	180 DAS	120 DAS	150 DAS	180 DAS	180 DAS	180 DAS	180 DAS	180 DAS
Growing media (M)													
M ₁ : Red soil	23.90	30.52	38.09	18.44	25.47	30.13	1.87	2.40	2.75	14.56	7.97	67.91	32.10
M ₂ : Red soil + FYM (1:1)	27.53	36.03	45.38	20.46	27.60	33.02	2.02	2.61	3.01	16.97	9.65	72.75	27.24
M ₃ : Red soil + FYM + Vermicompost (1:1:1)	29.38	38.53	47.00	22.48	30.29	36.34	2.10	2.70	3.12	17.67	10.06	75.26	24.73
S. Em±	0.30	0.49	0.40	0.37	0.26	0.60	0.02	0.02	0.01	0.16	0.09	0.52	0.53
C.D. at 5%	0.87	1.40	1.15	1.07	0.73	1.73	0.04	0.04	0.03	0.47	0.26	1.50	1.51
Foliar spray (F)													
F ₁ : Cow urine (3%)	25.32	33.09	40.80	19.31	25.69	31.09	1.94	2.47	2.85	15.75	8.81	70.20	29.79
F ₂ : <i>Amritpani</i> (3%)	25.89	34.26	41.86	19.60	26.84	31.69	1.97	2.55	2.91	16.26	9.11	70.37	29.62
F ₃ : Novel (1%)	28.29	36.78	46.44	21.42	28.84	34.67	2.06	2.67	3.07	17.23	9.78	72.74	27.25
F ₄ : <i>Panchagavya</i> (3%)	29.64	38.30	47.32	22.22	30.69	36.31	2.10	2.73	3.12	17.97	10.02	75.20	24.82
F ₅ : Vermiwash (10%)	29.00	37.60	46.61	21.91	29.64	35.60	2.07	2.68	3.09	17.61	9.83	74.65	25.35
F ₆ : Control	23.47	30.13	37.92	18.29	25.00	29.64	1.85	2.34	2.71	13.59	7.80	68.70	31.30
S. Em±	0.43	0.69	0.57	0.53	0.36	0.85	0.02	0.02	0.02	0.23	0.13	0.74	0.74
C.D. at 5%	1.22	1.97	1.63	1.51	1.03	2.45	0.06	0.06	0.04	0.66	0.36	2.12	2.13
Interaction (M x F)													
S. Em±	0.74	1.19	0.98	0.91	0.63	1.48	0.04	0.04	0.03	0.40	0.22	1.28	1.29
C.D. at 5%	NS	3.42	2.82	NS	1.80	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	4.75	5.89	3.91	7.73	3.90	7.71	3.30	2.56	1.73	4.23	4.10	3.09	7.95

Table 3: Interaction effect of growing media and organic foliar spray in acid lime

Plant height (cm)													Number of leaves					
150DAS							180 DAS						150 DAS					
M x F	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆
M ₁	29.33	29.70	31.40	32.03	31.80	28.83	36.03	37.00	39.80	40.20	39.93	35.60	23.47	26.73	25.60	26.33	26.13	24.53
M ₂	33.33	35.50	37.87	40.00	38.60	30.90	42.77	43.20	48.77	49.87	48.73	38.97	26.60	26.73	27.67	30.67	28.87	25.07
M ₃	36.60	37.57	41.07	42.87	42.40	30.67	43.60	45.37	50.77	51.90	51.17	39.20	27.00	27.07	33.27	35.07	33.93	25.40
S. Em±	1.19						0.98						0.63					
C.D. at 5%	3.42						2.82						1.80					
C.V. %	5.89						3.91						3.90					

Conclusion

From the foregoing results it can be concluded that the highest germination percentage, height of seedling, number of leaves, stem diameter, fresh and dry weight of seedling was found in media, red soil + FYM + vermicompost (1:1:1). Whereas, in foliar spray treatments, *panchagavya* @ 3% gave good results in all growth parameters.

References

1. Anonymous. Indian Horticulture Data base, National Horticulture Board, Ministry of Agriculture, Government of India, 2017.
2. Awasthi RP, Godara RK, Kaith NS. Interaction effect of *VAM mycorrhizae* and *Azotobacter* inoculation on peach seedlings. Indian J. of Hort. 1996; 53(1):8-13.
3. Chopde N, Patil BN, Paagr PC, Gawande R. Effect of different pot mixtures on germination and growth of custard apple (*Anona squamosa* L.). J Soils and Crops. 1999; 9(1):69-71.
4. Del R. A review of foliar fertilization of crops in India. Fertil. News. 1971; 16(12): 77-81.
5. Govind S, Chandra R. Standardization of suitable potting media for raising seedlings of khashi mandarin. Indian J. Hort. 1993; 50(3):224-227.
6. Hartmann HT, Kester E. Plant propagation principles and practices. Prentice Hall of India Private Limited, New Delhi- 110 001, 1997.
7. Kumar Y, Swamy HS, Shetty G, Thoke S. Effect of foliar spray of bio regulators, bio-formulations and climate influences on mango grafts. Global Conference on Smart Horticulture, Book of abstracts. 2014, 200.
8. Parasana JS, Leua HN, Ray NR. Effect of different growing medias mixture on germination and seedlings growth of mango (*Mangifera indica* L.) cultivars under net house conditions. Int. Quarterly J. of Life Sci. 2013; 8(3):897-900.
9. Prajapati DG, Satodiya BN, Desai AB, Nagar PK. Influence of storage period and growing media on seed germination and growth of acid lime seedlings (*Citrus aurantifolia* Swingle) Cv. Kagzi. J. Pharmacognosy and Phytochemistry. 2017; 6(4):1641-1645.
10. Shakila A, Anburani A. Effect of certain organics and press mud on growth and yield characters of tomato. Asian J. of Horti. 2008; 3(2):273- 276.
11. Srinivasulu A, Venkata Ramana KT, Mukunda Lakshmi L, Sudhakar P, Rnagaraju R, Gopal K. Effect of potting media on the growth of rangpur lime (*Citrus limonia* Osbeck) and Australian sour orange (*Citrus aurantium*) root stock seedlings. J Res. Angrau, 2015; 43(1, 2):88-95.