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Conserving Honey Bees with Forage Plant Mexican Creeper - *Antigonon leptopus*



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JOURNAL OF HORTICULTURAL SCIENCES

Volume 15

Number 2

December 2020

CONTENTS

In this Issue

i-ii

Review

- Biodiversity of tropical fruits and their conservation in India** 107-126
Sankaran M. and Dinesh M.R.
- An overview of canopy management in cashew (*Anacardium occidentale* L.)** 127-135
Adiga D.J., Veena G.L., Thondaiman V. and Babli M.

Original Research in Papers

- Phenotypic variability for horticultural and fruit quality attributes in plastic house grown tomato** 136-146
Adeniji O.T., Tenebe A.V., Ishaka A., Jandong E., Adamu J.T., Adekoya M., Zamzam M.A. and Aremu C.A
- Development and evaluation of novel gladiolus hybrid selections IHRG-7 (IC620379) and IHRG-11 (IC620380) for flower quality and *Fusarium* wilt resistance** 147-152
Rao T.M., Janakiram T., Negi S.S., Aswath C., Dhananjaya M.V., Kumar R. and Ramachandran N.
- Evaluation of potassium salt of phosphonic acid in Nagpur mandarin with special reference to *Phytophthora* management** 153-160
Ingle Y.V., Paithankar D.H., Sadawarte A.K. and Bhonde S.R.
- Genetic analysis in mango (*Mangifera indica* L.) based on fruit characteristics of 400 genotypes** 161-172
Sankaran M., Dinesh M.R., Gowda D.C.S. and Venugopalan R.
- Standardization of nitrogen application for potted *Chrysanthemum morifolium* cv. kikiobiory** 173-176
Tanya Thakur
- Influence of inorganic nutrients on growth, flowering and quality of *Dendrobium* cv. Singapore white** 177-182
Sujatha A. Nair, Sankar V., Muralidhara, B.M., Awcharae C.M. and Singh D.R.
- Palynological investigations in *Jasminum* spp.** 183-190
Ganga M., Lakshmi J., Manivannan N. and Rajamani K.



- Effect of putrescine and benzyl adenine on growth, flowering and post-harvest keeping quality parameters in chrysanthemum (*Chrysanthemum morifolium ramat*)** 191-196
Taranjit Singh and Madhu Bala
- Studies on bioavailability of iron from fe-fortified commercial edible mushroom *Hypsizygusulmarius* and standardization of its delivery system for human nutrition** 197-206
Pandey M., Gowda N.K.S., Satisha G.C., Azeez S., Chandrashekara C., Zamil M. and Roy T.K.
- Amino acid profile of eighteen isolate of different edible macrofungal species** 207-220
Azeez S., Pandey M., Jasmin M.R., Rachitha R., Satisha G.C., Roy T.K.
Chandrashekara C. and Shivashankara K.S.

Short Communications

- A promising new tamarind selection-lakshamana : Linking biodiversity with livelihood** 221-224
Kanupriya C., Karunakaran G. and Singh P.
- Mexican creeper, *Antigonon leptopus* Hook. and Arn : An effective bee forage plant to conserve honey bee** 225-228
Rami Reddy P.V.
- First report on honeydew excretion by the melon thrips, *Thrips palmi* karny (Thysanoptera : Thripidae) and its biochemical analysis** 229-232
Aravintharaj R., Asokan R. and Roy T.K.
- Influence of potting mixture on growth and economics of stone graft of mango cv. alphonso** 233-237
Lad O.A., Kulkarni M.M., Ragaji S.G., Gavankar M.S., Burondkar M.M., Gokhale N.B.
Pawar C.D., Khandekar R.G., Kshirsagar P.J. and Desai V.S.

In this issue...

Hearty New Year Greetings from our Editorial Team to all the readers of JHS!

As the world is slowly coming out of glitches of pandemic, there is no other better way than celebrating 2021 as Year of Fruits and Vegetables as announced by United Nations Assembly to welcome the new year and recognize the importance of nutrition for better health. Fruits and Vegetables ensure the Nutritional Security to humankind. They play key role in addressing the malnutrition that is a major concern. We are proud that JHS creatins awareness of importance of fruits and vegetables by publishing the recent developments in research with respect to these crops.

*Diversity of fruit crops and genetic resources available with respect to fruit crops are important for developing better fruit crop varieties. **Sankaran and Dinesh** have reviewed the “Biodiveristy of Fruit Crops in India” in a very comprehensive way. There is diversity in Jasmine species. **Ganga et al.** carried out the palynological investigations and recorded the variability in pollen morphology in different species of Jasmine by documenting images using scanning electron microscope. Biodiversity can be linked to livelihood also. One such success story with tamarind selection ‘Lakhamna’ is being reported by **Kanupriya et al.** This tamarind selection has been identified from participatory breeding programme. It has a better pod characters and more preferred by consumers.*

*Protected cultivation has seen greater momentum in last two decades. **Adeniji et al.** identified the best varieties of tomato for polyhouse cultivation in Nigeria. **Rao et al.** selected two gladiolus hybrid selections IIHRG-7 and IIHRG-11 with red purple and red coloured flowers respectively. These hybrids have resistance to Fusarium wilt and suitable for cut flower and flower arrangement purposes. **Sankaran et al.** analysed the variance for 6 quantitative and 30 qualitative traits in mango in 400 genotypes and identified 18 clusters. Selected genotypes from specific clusters can be used in hybridization programme.*

*The production aspects are important in perennial crops. It is crop management that needs to be prioritized for enhanced yield. **Adiga et al.** have reviewed the research work carried in “Canopy Management in Cashew”, providing the wholistic view of cultural operations to have a better crop. Use of soilless medium in nursery industry is gaining importance. Best suited potting mixture for mango stone graft of cv. Alphonso has been identified by **Lad et al.** They found that cocopeat + leaf manure + compost (1:1:2) as pot mixture provided better plant growth.*

*Growing Chrysanthemum in pots is practiced in home and terrace gardens. The cultivar Kikiobiory is well suited for this purpose. **Thakur** has studied the nitrogen requirement for this cultivar and has come out with the recommendation of 300 mg of N per pot applied*



twice in September and October in Punjab for best results. In another study, **Singh and Bala** confirmed that use of benzyl adenine at 200 ppm helped in extended vase life of *Chrysanthemum morifolium* flowers. **Nair et al.** recorded that foliar spray of 30:20:20 NPK at weekly interval recorded more number of flowers of *Dendrobium* cv. Singapore White with significantly longer spikes.

Crop production is directly influenced by pollinators. Decline in honey bee population is a serious concern and to conserve the pollinators community approach through ecosystem services is required. **Rami Reddy** reports the benefits of having ornamental plant Mexican Creeper (*Antigonon leptopus*) as forage plant. This creeper attracted all the four species of honey bees studied. This creeper can be used as bioindicator of honey bee population.

Aravindaraj et al. have reported the honey dew secretion by *Thrips palmi* and analysed the composition of it. They had identified different sugars present in the honey dew secretion of *Thrips*. *Thrips* not only cause direct damage but act as vectors of many plant viruses. Management of diseases in perennial crops is a challenge. *Phytophthora* incited root infection in citrus needs concerted efforts. **Ingle et al.** have demonstrated that use of potassium salt of phosphonic acid could help in management of *Phytophthora* root rot in Nagpur Mandarin.

Mushrooms can fill the gaps in nutritional security as they are rich in nutritive value. Iron deficiency is important issue to be addressed. Iron fortified oyster mushroom products have been developed by **Pandey et al.** The bioavailability of iron from Arka Mushroom Fe-Fortified Rasam Powder has been confirmed. In another study, the amino acid profile of 18 isolates of oyster mushroom species belonging to 4 species have been documented by **Azeez et al.** Quantification of essential and non-essential amino acids has been reported. Nutritionally superior isolates can be selected from these isolates.

The editorial team of JHS expresses the sincere efforts of reviewers who really complement the publication processes. All scientists and scholars can utilize the open access of JHS. Recently FAO has made JHS available through AGRIS. It is indexed by Redalyc, CABI_Hort and Scopus. All subscribers, scientists and scholars are requested to continue their support in publishing quality information in **Journal of Horticultural Sciences**.

S. Sriram
Editor in Chief

Short Communication

A promising new tamarind selection - Lakshamana : Linking biodiversity and livelihood

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ABSTRACT

Tamarind is a well-known commodity of Indian cuisine having medicinal and industrial uses. It is a nutritious tree crop of widespread occurrence growing on marginal lands in semi-arid and sub-humid tropical climates of India, making it highly valuable in ensuring food security for rural poor. Given the great potential of this neglected and underutilized species to address global challenges such as hunger, poverty and climate change adaptation, there is a need to revisit research and development priorities in its favor and to develop strategies together with stakeholders to increase its utilization. In the present study, a survey was undertaken in Tumkur district of Karnataka to characterize the variability available in tamarind for pod and tree characters and identify superior trees using horticultural traits. A farmer's tamarind selection "Lakshamana" emerged from participatory breeding having significantly better traits compared to local tamarind.

Key words: Tamarind, Selection, Pulp recovery and Yield

Tamarind (*Tamarindus indica*) is an evergreen tree legume, distributed all over the world in tropical and sub-tropical countries. The tree produces fruits in pods which consist of a brittle outer shell encapsulating the pulp and enclosed seeds. Once established, the tree develops a large tap root which protects it from strong winds and cyclones, making it well suited to the region prone to such weather phenomena. It is also considered to be a suitable tree for inter-planting with other commercial forest species. Tamarind starts bearing from 6-8 years and has productive life of 50-70 years after which it declines. The normal life span of the tree is 150 years. A typical established tree yields between 50-100Kg of fruit which is harvested during multiple picks over an 8-10-week period between February and April. Apart from tamarind pulp other by-products such as seed, shell, fiber is also useful for various purposes. Tamarind comes in two main types; sweet and sour. Sweet tamarind is harvested ripe and usually consumed fresh, while the sour tamarind is processed into a range of value-added products. Some of the most common products prepared from tamarind include juice, pulp, powder, chutney, pickles, sauces, sugar coated candies and Tamarind Kernel Powder (TKP). TKP is an important

sizing material for the jute and textile industry and tamarind seeds are gaining importance as a rich source of proteins and valuable amino acids. India is the world's largest producer of tamarind; it is estimated that 300,000 tons are produced annually. It is also an exporter of tamarind, mainly to Europe and Arab countries (Spice Board, 2018)

Recently, there has been an increased interest in finding alternative, potentially high-value cash crops to improve the income of small farmers who are currently depending upon growing and selling traditional cereal crops. Tamarind has a wide range of genetic variation in India, according to the phenotype and genetic characteristics which could facilitate identification of superior and desirable types. Being a highly cross-pollinated crop, and propagated from time immemorial by seeds, considerable amount of variability exists in the trees growing in different regions. Selection is the crop improvement method widely adopted in tamarind and varieties are being released using this method. The consumer preference is for traits such as broad, brown pulp with good pulp recovery which is currently not being met by the few released varieties. The present study was undertaken keeping in view the emerging



importance of the crop with the objective of identifying superior quality combined with high pulp recovery. In this context, a survey was undertaken in Tumkur district of Karnataka to characterize the variability available for pod and tree characters and identify superior trees using horticultural traits. *In situ* analysis of the samples collected from this region was carried out at ICAR-Indian Institute of Horticulture Research, Bengaluru and an elite tamarind variety was identified having broad pods with good pulp colour and recovery. Farmer’s tamarind selection “**Lakshamana**” emerged from participatory breeding

having significantly better traits compared to local tamarind.

Lakshamana -A promising tamarind selection

This is an accession identified from Nandihalli village of Tumkur district Karnataka, having passport data: latitude 13.52° N, Longitude-76.74° E and 860 m MSL growing in field of Shri Laxmannappa. It was found to be superior with better yield and pod characters compared to local and registered mean annual yield (4 years from 2016-2020) of 251.4 kg/tree as against 165.0 kg/tree in local trees (Table 1).

Table 1. Economic traits of promising selection Lakshamana in comparison to local check

Sl.No.	Traits	Lakshamana	Local
1.	Fruiting season	Feb-March	Feb-March
2.	Fruit bearing position	Terminal	Terminal
3.	Fruit clustering habit	Cluster of 2-3 or solitary	Clusters or solitary
4.	Fruit shape	Long, curved	Small, straight
5.	Pod length (cm)	25.4	13.5
6.	Pod breadth (cm)	3.8	2.36
7.	Number of pods/kg	24	49
8.	Number of seeds/pod	8.2	14.5
9.	Shell wt. (g/kg fruits)	250 (25%)	302 (30%)
10.	Pulp wt. (g/kg fruits)	430 (43%)	280 (28%)
11.	Seed wt. (g/kg fruits)	270 (27%)	380 (38%)
12.	Fiber wt. (g/kg fruits)	50 (5%)	47 (4.7%)
13.	Yield per plant (kg per tree)	251.4	165.0



Fig. 1. Close view of tamarind tree and grower

Lakshamana is a 40-year-old tree and regular bearer (Fig.1). It commences flowering in May-June, matures in February-March and harvesting can be done in March-April under Tumkur conditions. This is a lean period in this region when there is less agricultural activity. The farmers can use this time to process and pack the tamarind to get better price in market. The pulp of “Lakshamana” is of superior quality having light brown colour, it is broader in shape which is desirable for marketing and has less fiber content (Fig.2). The inner cavity is silvery and this encloses the seeds. The pulp recovery is high (43%) as against 28% in local tamarind trees.



Fig.2. Pods, pulp and seed of tamarind Lakshamana

The pulp of Lakshamana has been characterized for nutritional traits (acidity and sugars) and total acidity and total sugar was found to be 20% and 29.78%, respectively. It was also profiled for sugar through liquid chromatography with tandem mass spectrometry (LC-MS/MS) and organic acid by high-performance liquid chromatography (HPLC) (Table 2). Glucose and fructose are the major sugars and accounted for 96.8% of the total sugar content. Beside that small amount (<1%) of mannose, ribose, arabinose, rhamnose, *myo*-inositol, sucrose and maltose were also found. Among organic acid tartaric acid content was highest (18.61%). Although tartaric acid occurs in other sour fruits, but tamarind fruits are reported to be the richest natural source of tartaric acid. Tamarind is known to be simultaneously the most acidic fruit with the sweetest taste because of presence of high levels of reducing sugars (glucose and fructose) and tartaric acid. Combination of organic acid and reducing sugar gives sweet-sour taste to this fruit.

Table 2. Sugar and organic acid profile of Lakshamana with local check

Nutritional traits	Lakshamana (g/100g)	Local (g/100g)
Glucose	20.53	14.5
Fructose	10.64	7.66
Mannose	0.66	0.55
Ribose	0.06	0.06
Arabinose	0.05	0.06
Rhamnose	0.02	0.01
<i>myo</i> -Inositol	0.06	0.02
Sucrose	0.004	0.002
Maltose	0.006	0.013
Tartaric acid	18.61	17.62
Malic acid	2.88	2.65

Harvesting and processing of Lakshamana pods starts from February and lasts up to mid-June. The pods fall down on own or the branches are shaken with help of long poles or a person climbs and shakes the branch to break free the pods. The pods are collected and left out to dry in sun for a few days. Processing which involves breaking the shell and removing seeds is carried out to secure better market value. One person can process 15-20Kg pods per day and earn around Rs 400/day. The whole family of Shri Laxmannappa gets involved during this period for processing thus employment is generated. After the shell is removed, the pulp is inverted to discard the seeds. It is stacked in ring shape in bamboo basket with capacity of 50kg. Each basket fetches 1500 Rs. The seed is also sold at rate of 17 Rs/kg and the shell chips at 2.50 Rs/kg. The seeds of “Lakshamana” tamarind are bold type and 1 quintal of pulp produces approximately 40 kg seeds. Thus, primary processing and value addition activities have potential of improving livelihood. Collective marketing and little primary processing can significantly improve family income from this accession.

In recent years several community-based strategies that focus on documenting local diversity, raising awareness of its status and improving its performance through participatory breeding and selection have been developed. Another way to strengthen on farm conservation is to recognize and support individual farmers who make contribution

to on-farm conservation (Gruberg *et al.* 2013). This strategy coupled with emerging scientific and economic interest to promote and commercialize the tamarind products will be helpful in increasing its value through market-based interventions. Tamarind is well suited for the backyard, dry and waste land farming. Hence, identification of this potential accession besides increasing the area and

production could also address the issue of sustainability as the crop is climate resilient and profitable. Further, it also contributes towards rural livelihood security and employment for women during lean periods when there is less agricultural activity. There exists ample scope for area expansion under tamarind with superior fruit types all over India.

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AUTHOR INDEX - VOL. 15 (1&2) 2020

Name	Page	Name	Page
A		Gavankar, M. S.	233
Adamu, J.T.	136	Gokhale, N. B.	233
Adekoya, M.	136	Gowda D. C. S.	161
Adeniji, O.T.	136	Gowda, N. K. S.	197
Aghora T.S.	62	I	
Ahamed N.	17	Ingle Y. V.	153
Aravintharaj, R.	229	Ishaka, A.	136
Aremu, C.A.	136	J	
Ashok Kumar J.	45	Jadhav S.B.	67
Asokan, R.	229	Janakiram, T.	147
Aswath C.	93	Jandong, E.	136
Aswath, C.	147	Jasmin M. R.	207
Awcharae, C. M.	177	Jessy Mol K.K.	52
Azeez, S.	197, 207	K	
B		Kalaivanan D.	9
Babli, M.	127	Kanupriya, C.	221
Bala, M.	191	Karunakaran, G.	221
Bhatt R.M.	62	Katwate S.M.	67
Bhonde, S. R.	153	Khandekar, R. G.	233
Burondkar, M. M.	233	Kshirsagar, P. J.	233
C		Kulkarni, M. M.	233
Chandran, N. K.	81	Kumar D.	17
Chandrashekara C.	197, 207	Kumar, R.	147
D		L	
Desai, V. S.	233	Lad, O. A.	233
Dhananjaya, M. V.	147	Lakshmana Reddy D.C	52
Dinakara Adiga, J.	127	Lakshmi, J.	183
Dinesh, M. R.	107, 161	Laxman R.H.	35
G		M	
GaneshamurthyA.N.	9	Madhavi Reddy K	52
Ganga, M.	183	Manivannan, N.	183
		Manjunath B.L.,	35



Name	Page	Name	Page
Manoj Y.B.	52	Sankar V	177
Meena H.R.	72	Sankaran, M.	107, 161
Mohan N.	62	Satisha G.C.	197, 207
Muralidhara, B. M	177	Shejal A. Porob	97
N		Shilpa Pandurangaiah,	27
Nair A.K.	35	Shivashankar K.S.	27
Negi, S. S.	147	Shivashankara, K. S.	207
P		Singh D. R.	177
Paithankar, D. H.	153	Singh S.R.	17
Pandey, M.	197, 207	Singh, P.	221
Pawar, C. D.	233	Singh, T.	191
Priya Devi S	45, 97	Somasundaram J.	72
R		Sriram S.	81
Rachitha R.	207	Srivastava K.K.	17
Radha T.K.	72	Sudhakar Rao D.V.	27
Ragaji, S. G.	233	Sujatha A. Nair	177
Raghu B.R.	1	Susmita C.	62
Raghupathi H.B.	9	T	
Rajamani, K.	183	Tanya Thakur	173
Rajiv Kumar	93	Tejaswini Prakash	81
Ramachandran, N.	147	Tenebe, A.V.	136
Ramachandrudu K	45	Thangam M	45, 97
Rami Reddy, P. V.	225	Thondaiman, V.	127
Rao, T. M.,	147	V	
Rashmi I.	72	Veena, G.L.	127
Ravishankar K.V	27	Venugopalan, R.	161
Roy, T. K.	197, 207, 229	Vichare S.V	67
Rupa T.R	9	Y	
S		Yousuf S.	17
Sadashiva A.T.	27	Z	
Sadawarte, A. K.	153	Zamil, M.	207
Safeena S.A.	45	Zamzam, M.A.	136

SUBJECT INDEX - VOL. 15 (1&2) 2020

Name	Page	Name	Page
A			
Alphonso	233	Foot rot	152
Amino acid score	207	Free amino acids	207
Antigonon	225	Fruit development	97
Anti-senescence compound	191	Fruit trees	9
Apis spp	225	Fruit quality	136
Arka Mushroom Rasam	197	Fruit shape	136
B			
B:C ratio	233	Fruit yield	136
Bee flora	225	Fruits	107
Bioavailability	197	Fusarium wilt	147
Biplot analysis	161	G	
Bound amino acids	207	Garden pea	62
Breeding	62	GCV	161
Bulb	67	Genetic diversity	17
C			
Canopy management	127	Genetic analysis	161
Carotene	27	Genetic divergence	45
Carotenoid	27	Genotype by environment	136
CGMS	52	Gerbera	93
Character correlation	136	Germplasm	1, 107
Chrysanthemum	173, 191	GIS	107
Conservation	107	Gladiolus	147
Copper	72	Goa	97
Correlation coefficient	45	Groundwater depletion	9
Curry leaves	1	Growth	67
Cut flower production	177	Growth parameters	233
Cut-flower	93	Gummosis	152
D			
Delayed flowering	191	H	
Dendrobium	177	Heritability	161
Distribution	1	High temperature	62
Diversity	1	Honey bees	225
Drought	9	Honeydew	229
E			
Early summer	62	Hot pepper	52
Evaluation	93, 147	Hybrid	67
Ex situ	107	Hypsizygus ulmarius	197
F			
Flower	67	I	
Flowering	147	In situ	107
		Iron	72
		Iron fortified	197
		J	
		Jasminum spp	183
		K	
		Kikiobiory	173



Name	Page	Name	Page
L			
LC-MS-MS	229	Pruning	127
Leaf analysis	72	Pulp recovery	221
Lycopene	27	Q	
M			
Manganese	72	Quality	177
Mango	161, 233	Quantitative character	45
Marker Assisted Selection	52	R	
Micronutrient deficiency	72	Resistance Gene Analogues (RGA)	81
Mitochondria	52	Rootstocks	127
Morphotypes	1	Rose	81
Mushrooms	197	S	
N			
Nagpur mandarin	152	Sapota	72
Nitrogen	173	Scheduling irrigation	35
Novel hybrids	93	Selection	221
Nucleotide Binding Site-Leucine	81	Single linkage cluster analysis	17
Rich Repeats (NBS-LRR)		Single type tuberose	67
Nutrients	177	Soil volume wetting	35
Nutrition	207	Soilless media	233
O			
Onion	17	Solanum lycopersicum	136
Orchid	177	Spacing	35
ORF	52	Standardization	173
Ornamental creeper	225	Stress tolerance	62
P			
Palynology	183	Sugars	229
Papaya yield	35	T	
PBZ	127	Tamarind	221
PCV	161	Thrips palmi	229
Peak water	9	Tomato	27
Perennial crops	9	Training	127
Phytophthora	152	Tropical	107
Pink types	97	V	
Planting geometry	127	Variability	136
Podosphaera pannosa	81	Varieties	107
Policy issue	9	Vase life	147, 191
Pollen germination	183	Vegetable cowpea	45
Pollen morphology	183	W	
Polyhouse	93, 136	Water use efficiency	35
Potassium salt of phosphonic acid (PSPA)	152	Wax apple	97
Potted plants	173	White types	97
Powdery mildew	81	Wild species	107
Principal component analysis	17	Y	
		Yield	221
		Z	
		Zinc	72



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