



INDIAN Horticulture

May-June 2019

Ivy gourd



Vertical garden: Sky is the limit

A vertical structure was designed and developed at ICAR-Indian Institute of Horticultural Research, Bengaluru for growing the desired vegetable, flowers and medicinal crop using the vertical space. A family can grow its choice of vegetables to meet family's daily vegetable/nutritional requirement to some extent. The consumer also controls the use of fertilizer, pesticide and inspective to its safe limit and one can also know what one consumes.

IN recent past, urban areas have become thickly populated, and indiscriminate use of chemical fertilizers and chemicals higher than the scientifically recommended doses has resulted in accumulation of pesticide residues in the produce which affects the human health instead of its goodness. Society also understands the importance of healthy vegetables and fruits and prefers to consume them. Hence, urban population wishes to grow a small garden similar to the one which used to be a part of every backyard of a village house. But space is the limiting factor to have one such small garden though the society has interest to grow its own vegetables, flowers and herbs. However,

few of them grow selected vegetables, fruits, flowers and medicinal crops in pots or in growbags within the available space to satisfy their needs to some extent.

Individual portion in every apartment has a utility area or terrace. Research institutes have developed soilless culture technologies for growing vegetables, flowers, medicinal and fruit crops for conventional farming.

Technology

The vertical structure is designed considering i) size suitable for terrace/utility area, ii) to grow vegetables consumed by a family on daily basis, iii) pots suitable for respective vegetables/ leafy vegetables/flowers/ medicinal plants, iv) structure suitable for handling in terms of height of reach, mobility, requirement of light available to all the pots and v) effective utilization of maximum area for growing plants. The vertical garden structure has three major sub structures, viz. base frame, main central support and supports for pots/grow bags. Base frame can either be square or circular in shape occupying one square meter area. Main center support is a rectangular shape frame/ tube anchored to the base frame with necessary supports. Support for pots/growbags are fabricated suitable for different pot sizes and shapes and fitted at four different height



1. Round pots/grow bags for vegetable crops, 2. Rectangular pots (big size),
3. Rectangular pots (small size), 4. Drip system for watering,
5. Plastic container for water.

levels. Heavy duty nylon caster wheels are fitted at the bottom of the base frame for the mobility of the vertical garden structure.

Pots suitable for growing different vegetables, flowers and medicinal plants are selected (Table).

The selection of pot size is based on the growing media requirement to facilitate proper growth during the crop period. The vertical garden has four height levels, the top most level was decided based on maximum reach of a normal human being hand reach.

The pots at levels 2,3 and 4 can be interchanged. Shade loving medicinal plants (long pepper, ondelaga, brahmi) can be grown in level 2.

Irrigation system

A twenty five litre plastic container is mounted at the

Pot shape and size suitable for different vegetables, leafy vegetables, medicinal and flower crops

Name of plant	Pot size	Pot shape
Vegetable crops (Chilli, Peas, Zucchini, French bean, Brinjal)	12"x10" (DxH)*	Round shape
Vegetable crops (Tomato)	16"x12" (DxH)*	Round shape
Leafy vegetables (Palak, Amaranthus, Coriander)	26"x8"x6" (LxWxH)* (Required wide space and depth of growing media of about 15 cm)	Rectangular shape
Medicinal crops (Centella, Brahmi, Long pepper, Coleus aromaticus (Doddapatre), Shatavari, Ashwagandha)	14"x8"x6" (LxWxH)* (Consumed less in quantity and depth of growing media is about 15 cm)	Rectangular shape

*D, Diameter; H, Height; L, Length; W, Width. **Arka Fermented Cocopeat

Vertical garden...

Yield of different crops during one crop cycle (2-4 months) in vertical garden

Name of vegetables/ flower/medicinal plant	Duration of plant (Months)	Yield/plant (so far) Three and a half month period	Plucking commenced
Chilli	4	973 g (223 fruits)	6 weeks after transplanting
Peas	3	76 g (15 pods)	10 weeks after transplanting
Zucchini	3	2100 g (10 fruits)	10 weeks after transplanting
French bean	3	220 g (34 pods)	10 weeks after transplanting
Brinjal	4	1134 g (27 fruits)	10 weeks after transplanting
Tomato	4	5.7 kg (85 fruits)	10 weeks after transplanting
Palak (one time pull out)	2-3 months	600 g	6 weeks after transplanting
Amaranthus (one time pull out)	2-3 months	520 g	6 weeks after transplanting
Coriander (one time pull out)	1.5 month	210 g	6 weeks after transplanting
Centella	Perennial	200 g/month	6 weeks after transplanting
Brahmi	Perennial	220 g/month	6 weeks after transplanting
Coleus aromaticus (Doddapatre)	Perennial	285 g/month	4 months after transplanting
Amruthaballi	Perennial	80 g/month	2 months after transplanting
Garden mint	Perennial	150 g/month	6 weeks after transplanting
Pepper mint	Perennial	118 g/month	6 weeks after transplanting
China aster	3 months	38 flowers/pot cycle	2 months after transplanting
Chrysanthemum	3 months	27 flowers/pot cycle	3 months after transplanting

Factors for placement of different crops in vertical garden

Type of crop	Level	Factor considered for the respective level
Vegetable crops (Tomato, Chilli, Brinjal, Peas etc.)	Level - 4 (Bottom most level)	These crops grow to a height of about two feet. Weight of pot (including growing media, plant and vegetable) will be the heaviest. Requires training.
Leafy vegetables (Palak, Amaranthus, Coriander etc.)	Level - 3 (Just above bottom most level)	These crops grow to a height of about one feet. Weight of pot (including growing media, plant and vegetable) will be lighter than the pots at level 4.
Medicinal crops (Centella, Brahmi, Long pepper Coleus aromaticus (Doddapatre) Shatavari, Ashwagandha, etc.)	Level - 2 (Above level-3)	These crops grow to a height less than one feet. Weight of pot (including growing media, plant and vegetable) will be lighter than the pots at level 3 & 4. Size of pot is also smaller than pot at level - 3 which is easier for handling at higher levels.
Flower crops/Medicinal crops (Chrysanthemum, china aster, rose)/ Medicinal crops	Level - 1 (Above level-2)	Keeping flower crops at height will give good appearance.



Vertical Garden

Watering can be done by using rose water cans also.

The weight of vertical garden structure is about 25 kg and is about 130 kg including growing media, plant and produce weight during crop period and water. It is also estimated that twice the area occupied by the vertical garden structure would be required to grow the same plants on flat (horizontal) surface area. The economics of vertical garden shows that it remunerative venture.

SUMMARY

The vertical garden structure developed by ICAR-Indian Institute of Horticultural Research, Bengaluru is useful for urban and peri-urban society for safe growing of

Cost involved in the vertical garden

Material	Cost (₹)
Vertical garden structure (One time investment)*	15,000.00
Recurring expenditure per crop cycle**	
Vertical garden structure	477.50
Input cost (Seeds/seedlings, growing media, crop production and protection chemicals)	137.50
Income from the produce per crop cycle	1200.00
Cost Benefit Ratio	1:1.95

*Life of the structure is 15 years. ** One crop cycle – 3 months

top of the structure and necessary drip laterals, micro tubes and drippers are provided to water the plants.

the daily vegetable/nutritional requirement of a family. This structure can also be used by anyone who desires to grow vegetables, medicinal and flower crops using vertical space. By utilizing vertical space, unit area utilization is increased by two folds. Ensuring consumption of safe vegetables results in better health of society.

For further interaction, please write to:

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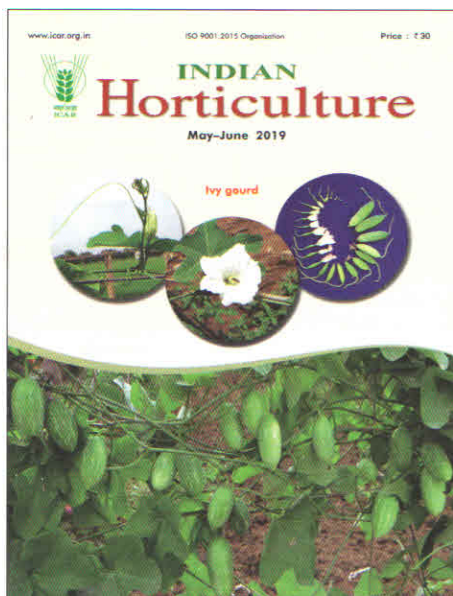
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CONTENTS

Vertical garden: Sky is the limit <i>A Carolin Rathinakumari, D Kalaivanan, G R Smitha and G Senthil Kumaran</i>	Cover II
<i>From the Editor</i>	2
In Kanker... Nutritional gardens for health and wealth <i>Birbal Sahu and Suresh Markan</i>	3
In Chhattisgarh... Grass pea cultivation in rice fallow fetches more return <i>P Mooventhan, Jagdish Kumar, Anil Dixit, K C Sharma, P N Sivalingam, Amit Kumar Gupta, Uttam Singh, S R K Singh, P Venkatesan and Pankaj Kaushal</i>	5
Arka Rakshak tomato to solve farmer woes <i>P Mooventhan, Jagdish Kumar, Anil Dixit, K C Sharma, P N Sivalingam, Amit Kumar Gupta, Uttam Singh, S R K Singh, P Venkatesan and Pankaj Kaushal</i>	8
Gold from marigold <i>R K Arora, Pawan Kumar Sharma, Parveen Kumar and Rajbir Singh</i>	10
Oyster mushroom cultivation for resource poor tribal farmers <i>P Mooventhan, Jagdish Kumar, Anil Dixit, K C Sharma, N Sivalingam, Amit Kumar Gupta, Uttam Singh, S R K Singh, P Venkatesan and Pankaj Kaushal</i>	13
Post-harvest management in mint and rose <i>I Singh, M Kumar, G Singh, P Kumari, A Karel, S Kumari and P P Rohilla</i>	15
GAP and market linkages enhanced mango grower's income in Malihabad <i>Maneesh Mishra, A K Verma, P S Gurjar, Gundappa and S Rajan</i>	17
In Bundelkhand... Quality onion production during kharif season <i>R K Singh, Nikhil Singh and S V Dwivedi</i>	21
Successful production of potato seed in Gujarat <i>Ashok K Somani, Ashok Patel and George Thomas</i>	24
Mushroom production is remunerative <i>D K Rana and P K Gupta</i>	28
Supper from your terrace <i>P S Khapte, Pradeep Kumar, Akath Singh and Praveen Kumar</i>	30
Urban landscaping for sustainable cityscapes <i>Shewtashri Mohanan and V L Sheela</i>	34
Popularising strawberry cultivation in Jammu and Kashmir <i>N A Ganai, Khalid Rasool and Angrej Ali</i>	41
Inspiring Story of a Woman Farmer: SAARC – Nepal <i>Ravinder Verma</i>	44
Ivy gourd at a glance <i>T. Janakiram</i>	Cover III