



# इंस्टीट्यूट ऑफ़ हॉर्टीकल्चर टेक्नोलॉजी Institute of Horticulture Technology

Recognised by Ministry of Agriculture & Farmers Welfare, Government of India

Newsletter, September- October, 2017  
National Seminar Special

## National Seminar on Krishak – Nursery Samadhan Solutions for Quality Planting Material



13<sup>th</sup> -14<sup>th</sup> October 2017

at

Farmers Training Centre

Directorate of Horticulture and Food Processing,  
Govt. of Assam, Khanapara, Guwahati- 781022, Assam

### Organizer



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Institute of Horticulture Technology  
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ISO 9001 : 2008

### Knowledge Partner



Indian Council of Agricultural  
Research, New Delhi

### Co Organizer



Assam Agricultural University  
Jorhat, Assam

### Supported by



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# Foreword

Institute of Horticulture Technology- IHT is country's leading institute for capacity building of stakeholders in nearly all aspects of modern horticulture. Institute also organizes national and international level horticultural events so as to provide a platform for transference of technologies and sharing knowledge amongst the stakeholders. IHT has taken a great leap forward in enhancing the employability of trained manpower in horticulture sector by linking it's programmes with Agriculture Skill Council of India (ASCI) and with Pradhan Mantri Kaushal Vikas Yojana (PMKVY).

## Pan India Reach Out

The institute has a pan India foot print as it operates in all most all the states and union territories for imparting location based trainings and farmers coming from across the states to avail specialized trainings at IHT's main campus in Greater Noida. States and UT's from where the farmers and officials were trained during last eight years include Madhya Pradesh, Himanchal Pradesh, Uttar Pradesh, Uttarakhand, Rajasthan, Bihar, Jharkhand, West Bengal, Chhattisgarh, Gujarat, Maharashtra, Orrisa, Andhra Pradesh, Karnataka, Sikkim, Assam, Arunanchal Pradesh, Manipur, Nagaland, Mizoram, Delhi and Andaman and Nicobar. The institute is already conducting onsite trainings at district and block level in Chhattisgarh state since 2014.

## International Programmes

Wageningen University & Research-WUR, The Netherlands having come forward to partner with Institute of Horticulture Technology-IHT for international training programmes is testimony to the high standards maintained by the institute. International training programme on "Modern Technology of Vegetable Production" organized and conducted by IHT earlier this year, had participants from 10 countries and was highly appreciated as evinced by the participants feedbacks. The institute has designed new programmes of study tour in the partner ship project with WUR of the Netherlands. These programmes will be immense value for Govt. officials, trainers and progressive farmers.

## IHT North East Regional Centre Mandira, Kamrup, Assam

In the year, 2016 in view of the specific needs of North East region, Institute of Horticulture Technology established its regional centre at Mandira Kamrup in Assam. The centre has 100 acres of land and other infrastructure facilities for the purpose of trainings, research and development of horticulture in the North East region of the country.

## Recognitions

Institute of Horticulture Technology is recognized by Ministry of Agriculture and Farmers Welfare, Ministry of Science and Technology, Ministry of External Affairs Government of India. Wageningen University and Research, The Netherlands is now partnering with IHT is a recognition to IHT's excellence in capacity building in Agriculture/Horticulture. Assam Agricultural University accorded recognition to IHT long ago.

## Objectives

- Train manpower for catering to the requirements of horticulture sector by offering short and long term courses in different fields of horticulture.
- Offer skill development courses and certification of skills in agriculture/horticulture sector by ASCI and PMKVY to enhance employability of youth and man power engaged in informal sector
- Transfer advanced technology into India via international training programmes with Wageningen University and Research, The Netherlands and other organizations.



- Undertake applied research, development and extension activities for improving productivity, quality and profitability from horticulture sector across the country.
- Organize such horticultural events, expositions, seminars, expert talks, field days and field visits as would providing a platform for transference of skills, expertise and knowledge sharing for the benefit of farmers, officials, extension workers, policy makers, persons from industries and other stake holders in horticulture sector.

### **State of the Art Infrastructure**

The infrastructure facilities in the institute include well equipped class rooms with world class teaching aids, computer lab, modern library with relevant publications, well developed technology display centre and a museum with variety of components used in greenhouse. The field facilities consist of 4 acres of technology park having Hi-tech greenhouses complex for practical training on protected cultivation of vegetables and ornamental plants. Most up to date facilities of microirrigation and fertigation are operational both in open and protected cultivation systems. Besides having fully automated intelligent greenhouse there is an array of net houses and low cost polyhouses, available to conduct end to end trainings in horticultural crop production. The plug nursery production unit of IHT has the facility of hi-tech greenhouse equipped with boomer irrigation and fertigation system for growing nursery and high value crops during high temperature conditions. Almost an equal area in the technology park is dedicated to open cultivation of fruits, vegetables, ornamental and medicinal plants. The institute has hostel facilities with separate arrangement for stay of boys and girls.

### **Faculty and Experts**

The faculty and experts of IHT consist of fifteen well qualified, experienced, dedicated and trained personnel at the main campus besides, an equal number at Regional North East Centre Mandira, Assam and at training centres in other states of the country. IHT has visiting national and international guest faculty on it's panel which is regularly invited for conducting various training programmes, and joining on national and international events organized by it from time to time.

### **IHT as Training Partner of Agriculture Skill Council of India-ASCI & PMKVY**

Institute of Horticulture Technology has now been accredited as training provider and training partner, under the two flagship schemes of govt of India i.e ASCI and PMKVY.

Two training programmes for Mizoram demonstrators were conducted in September this year, resulting in hundred percent successful certification by the external assessor

### **Training and Exposure Visit Programmes**

Capacity building courses of varying durations both at its main campus in Greater Noida as well as in different states under varying agro climatic conditions are being conducted over the past nine years. Training courses offered at the institute are frequently redesigned and updated so as to meet capacity building needs of farmers, extension officials, youth and entrepreneurs in a more efficient, effective and appropriate manner. Most of the training courses are of short duration of 5 to 7 days, while the certificate courses are of one, three and six month durations. These courses are conducted based on innovative three dimensional model that is "Interactive lectures" followed by "hands on training" and finally supplemented with demonstrations and exposure visits. There are now 64 structured training courses clubbed under various categories such as 1) Innovative Technologies 2) Planting Material Production 3) Protected Cultivation Structures 4) Polyhouse Production Technology 5) Hi- Tech Production Technology 6) Urban and Peri Urban Horticulture 7) Oppurtunities for Youth in Horticulture 8) Skill Development Courses 9) Certificate Courses and 10) Crop specific Courses. Besides these, capacity building programmes are customized as per the felt needs of the farmers by developing technology modules for different



climatic regions and specific production systems of the areas including region specific crops. In a short span of eight years since inception the institute conducted 321 trainings and exposure visits, of the total of 53,310 persons trained. The Institute also offers technical exposure visits to various horticultural public and private sector organizations for the benefit of farmers and other stake holders.

The institute has undertaken a programme of exposure visits for school children to the Technology park with a view to inculcate the importance of horticulture nutrition and climate change. Thus far over 1000 children from 15 schools have availed the benefits of visiting open fields and green houses and interaction with our faculty.

### **National Level Events and Honouring Excellence**

IHT has been holding national level events namely Horti India, 2012 and 2013 and earlier this year Horti India 2017 demonstrating latest technologies and interaction with top national and international experts. A National seminar on 'Commercial Hydroponics Technology' was organized on 10th February, 2015 with practical demonstrations which was the only one of its kind thus far held in the country where practical demonstration of hydroponics on commercial scale was on display for the youth and entrepreneurs.

On 24th August, 2016 it was a privilege for IHT to felicitate Dr. Wolfgang Pfeiffer of Harvest plus, under whose leadership more than 130 fortified varieties of wheat, millet have been developed and released in more than 30 countries and more than 1 million biofortified. In 2016 Harvest Plus director Dr. Howarth Bouis won World Food Prize for ensuring nutritional security through biofortification

### **Publications**

The institute has been regularly bringing out its bimonthly News Letters and making it available on IHT web portal which generally includes short articles and synopsis of lectures given to the trainees. A compendium of lectures on "Application of Innovative Production Technologies in Horticulture" brought out by the institute is a quality document and is being used in training programmes. The institute has also published four training manuals recently namely, 1) Basics of Vegetable Production Technology, 2) Protected Cultivation of Vegetable Crops, 3) Good Agricultural Practices in Vegetable Production Systems, and 3) Open Vegetable Production Systems and Post Harvest Management. Translation of these manuals has also been done in Hindi for the benefit of farming community. A training manual in Assamese on "Quality Planting Material" has also been brought out by IHT, similarly four training manuals on Establishment of Hybrid Dendrobium Orchid Cut Flower Production System namely 1) Establishment of Net house 2) Production Technology 3) Post Harvest Management and Value Addition 4) Market Intelligence and Marketing has also been prepared.

Dr. U. K. Kohli  
Director  
Institute of Horticulture Technology



## IHT Approved as Training Partner and Training Provider under ASCI and PMKVY

Institute of Horticulture Technology (IHT) is now an approved partner of Agriculture Skill Council of India (ASCI) and is offering following training programme of 8-60 days duration.

1. Floriculture protected
2. Floriculture open field
3. Vermiculture and vermicompost producer
4. Solanaceous crop producer (Applied for)

The institute is also an approved training provider of Nation Skill Development Corporation – NSDC and offering following courses under PMKVY (Pradhan Mantri Krishi Vikas Yojana) and RPL (Recognition of Prior Learning) programme. The job roles for which IHT has been recognised are:

1. Gardener
2. Greenhouse Operation
3. Micro-irrigation Technician
4. Organic Grower
5. Quality Seed Grower
6. Solar PV installer (Surya Mittar)

The institute turned out two batches of 8 and 17 demonstrators in Horticulture those after getting training from IHT were certified by Agriculture Skill Council of India (ASCI). The trainees belonged to the state of Mizoram. With cent per cent trainees having qualified for certification, speaks high of IHT's training quality. Institute has been providing trainings to growers and horticulture officials from different states of India viz. Assam, Arunachal Pradesh, Andaman and Nicobar Islands, Jharkhand, Uttarakhand, Himachal Pradesh, Gujarat, Madhya Pradesh, Sikkim, Nagaland, Mizoram, Odisha etc. from past three years. The trainees have been immensely benefitted by this "Hands on training" received from our Institute by our experts. More than 50,000 trainees have been benefitted out of these trainings. IHT also offers tailor-made specialized training programs to the horticulture officials, farmers and other professionals as per their requirements.

## Trainings Conducted During August-September, 2017

S. No.	Duration & Date	Title of Training	Status of Training	State
1	3 Days 02 to 04 August 2017	Horticultural Production Technologies for Enhancing Productivity	Progressive Farmers	Assam
2	3 Days 10 to 12 August 2017	Vegetable/Floriculture Production Technology under Protected Conditions	Horticulture Demonstrator	Mizoram
3	6 Days 03 to 08 Sep. 2017	Vegetable/Floriculture Production Technology under Protected Conditions	Horticulture Demonstrator	Mizoram
4	3 Days 18 to 20 Sep. 2017	Modern Technology of Forest Plant Nursery Production	Forest officer	Madhya Pradesh





## New Training Courses Designed by IHT

Institute of Horticulture –IHT has redesigned its training courses as per changes and advancement in technology. The courses are liked to skill development and enhance employability of the trainees.

TRAINING MODULE			
S. No.	Course Code	Course Title	Duration
<b>Innovative Technologies</b>			
1	INT-001	Modern Nursery Production Technology	5 Days
2	INT-002	Protected Vegetable Cultivation	5 Days
3	INT-003	Protected Flower Cultivation	5 Days
4	INT-004	Canopy Management of Fruit Plants	5 Days
5	INT-005	High Density Planting-I	5 Days
6	INT-006	Micro Irrigation and Fertigation	5 Days
<b>Planting Material Production</b>			
7	PMP-101	Plug Nursery Production– Vegetables	1 week
8	PMP-102	Plug Nursery Production - Flowers and Ornamentals	1 week
9	PMP-103	Root Trainer Nursery Production–Fruits	1 week
10	PMP-104	Tissue Culture of Horticultural Plants	1 week
11	PMP-201	Hardening of Ex. Vitro Horticultural Plants	2 weeks
<b>Protected Cultivation Structure</b>			
12	PCS-105	Introduction to Protected Structures	1 week
13	PCS-106	Polyhouse Construction and Maintenance	1 week
14	PCS-107	Climate Control in Polyhouses	1 week
<b>Poly house Production Technology</b>			
15	PPT-108	Soil Health Management	1 week
16	PPT-109	Soil Moisture Conservation	1 week
17	PPT-110	Drip and Fertigation Technology	1 week
18	PPT-111	Training ,Pruning and Trellising	1 week
19	PPT-112	Integrated Pest Management	1 week
<b>Hi Tech Production Technology</b>			
20	HPT-113	Rejuvenation of Unproductive Fruit Plants	1 week
21	HPT-114	High Density Planting II	1 week
22	HPT-115	Quality Vegetable Production	1 week
23	HPT-116	Quality Flower Production	1 week
24	HPT-202	Planning, Layout and after care of Fruit Plantation	2 weeks
25	HPT-203	Mushroom Production	2 weeks
<b>Urban Peri-Urban Horticulture</b>			
26	UPH-117	Nursery Production for Kitchen Gardens	1 week
27	UPH-118	Hydroponics and Aeroponics	1 week
28	UPH-119	Year Round Vegetable Production	1 week
29	UPH-120	Home Scale Mushroom Production	1 week
30	UPH-121	Home Scale Fruit and Vegetable Preservation	1 week
31	UPH-122	Home Scale Waste Management	1 week
<b>Opportunity for Youth in Horticulture</b>			
32	OYH-204	Innovative Nursery Production	2 weeks
33	OYH-205	Polyhouse Vegetable Production	2 weeks
34	OYH-206	Polyhouse Cut Flower Production	2 weeks
35	OYH-207	Commercial Mushroom Production	2 weeks
36	OYH-208	Urban Landscaping	2 weeks
37	OYH-209	Mechanization in Horticulture	2 weeks
38	OYH-210	Post Harvest Management of Fruits and Vegetables	2 weeks
<b>Skill Development Courses</b>			
39	SDC	Gardner	1 month
40	SDC	Greenhouse Fitter	1 month
41	SDC	Vegetable – Open Cultivation	1 month
42	SDC	Vegetable – Protected Cultivation	1 month
43	SDC	Floriculture- Open Cultivation	1 month
44	SDC	Floriculture – Protected Cultivation	1 month
45	SDC	Micro Irrigation Technician	1 month
<b>Certificate Course</b>			
46	CCH- 301	Commercial Vegetable Production	3 months



## National Seminar on “Krishak-Nursery Samadhan- Solutions for Quality Planting Material”

Institute of Horticulture Technology and Assam Agricultural University are jointly organizing National Seminar on “Krishak-Nursery Samadhan - Solutions for Quality Planting Material” on 13<sup>th</sup>-14<sup>th</sup> October, 2017 at Farmers Training Centre, Directorate of Horticulture and Food Processing, Govt. of Assam, Khanapara, Guwahati- 781022, Assam.

### Significance

Quality Planting Material (QPM) in horticultural crops impacts all dimension of horticultural production systems, such as crop health, yield, quality and marketability of the final produce. In fact the success and failure of entire venture rests upon selection and quality of seed and planting material, it's being true to type, free of pest and diseases, vigorous and having high genetic potential. Ever since the advent of plug or “V” type nursery plants and tissue cultured plants in horticulture, the role of Hi-Tech nurseries has assumed significant importance in Horticulture. Therefore, QPM being the most important vertical on which Horticultural Production Systems rest, Institute of Horticulture Technology and Assam Agriculture University decided to organize the National Seminar “Krishak-Nursery Samadhan-Solutions for Quality Planting Material” on 13<sup>th</sup>- 14<sup>th</sup> October, 2017 at Farmers Training Centre, Directorate of Horticulture and Food Processing, Govt. of Assam, Khanapara, Guwahati- 781022, Assam in the College of Veterinary, for benefit of all stake holders especially Kisan-The farmer.

The national seminar is being supported by leading public organizations namely National Horticulture Board (NHB), Coconut Board, Institute of Bioresources and Sustainable development (IBSD) Manipur, Department of Biotechnology, GOI, Department of Horticulture, Govt. of Assam, National Bank For Agriculture & Rural Development (NABARD), Coir Board and Indian Council of Agricultural Research (ICAR) as Knowledge Partner.

The national seminar is therefore aimed at making participants aware of the changing scenario and technological advancements that has led to quality nursery production of fruits, vegetables, ornamental, medicinal and aromatic and forest plants in sizable quantities. Production of plug nursery under protected conditions, clonal propagation under controlled conditions, use of root trainers and micropropagation are some of the new advancements in the area of quality planting material (QPM) of horticultural crops. North East states require such large scale nursery production facilities as would meet the demands of horticulture and forestry sectors and ensure higher profits to farming community.

### The Participants

The participants expected to attend the seminar would include policy planners from Agriculture Ministry Govt. of India, Directors of Horticulture of different States of North-East, and representatives of ICAR Institutes in various states, progressive farmers and entrepreneurs as well as the other stake holder engaged in nursery production. The National seminar will have sessions on fruits, vegetables ornamental, medicinal and aromatic and forestry plant nursery production in pre and post lunch sessions. The lead lectures will come from the national and international experts representing their respective fields.

Dr. K.M. Bujarbaruah, Vice-Chancellor, Assam Agricultural University (AAU) has kindly consented to chair the seminar, While Dr. A. K. Singh, Deputy Director General (Horticulture) ICAR, Dr. M. Premjit Singh, Vice-Chancellor, Central Agricultural University (CAU) and Dr. Dinabandhu Sahoo, Director IBSD, Imphal has agreed to co-chair the National Seminar. Dr. A. K. Singh, Deputy Director General (Horticulture) ICAR, has consented to deliver the key note address on status of quality planting material of horticultural crops in India.

## Thematic Areas

The seminar is mainly focused on Hi-Tech production technology of quality planting material, the major areas to be covered are as under

- Modern technology of plug nursery production for vegetables, flowers, fruits, medicinal & aromatic, forestry and ornamental plants.
- Production of quality planting material of fruits, vegetables, flowers, medicinal & aromatic, forestry and ornamental plants
- Use of protected structures in production and maintenance of quality planting material and elite planting material.
- Seed quality assurance of vegetables, flowers, fruits, medicinal & aromatic, forestry and ornamental plants.
- Sustainable management of horticulture and forestry resources through modern techniques of raising quality planting material.

### Hi-Tech Nurseries at IHT

There is sudden increase in the demand for certain commercial plants seedlings. For example nursery of expensive hybrid vegetable and flower plants, tissue cultured banana, gerbera, carnation and orchids etc. It is not possible to fulfill this requirement by ordinary or common nursery practices, only Hi-tech nurseries can satisfy this type of demand. Modern greenhouses allow automated control of temperature, ventilation, light, watering and feeding. These also allows "hardening-off" of plants. We have it at IHT





# Institute of Horticulture Technology - Mandira, Assam to Conduct Training Programme on Propagation, Production and Marketing of Dendrobium Cut Flower

In order to take advantage of the assemblage of national and international experts, the training on Dendrobium cut flower production and marketing is also being held along with the national seminar on quality planting material. A parallel session for the same would be run along with the national seminar. A large number of farmers and entrepreneurs from Manipur and Assam are expected to take part in this training programme on orchid cultivation. The training programme is being organized by IHT-Mandira campus of Assam.



Tissue cultured raised 6 months old and 1 year old plants of hybrid Dendrobium, Sonia-17 before being plugged into coconut blocks at Institutes of Horticulture Technology.



Starting a new crop of Dendrobium orchid under modern orchaderium at IHT



Quality Dendrobium orchids come to bloom at IHT, Greater Noida

## Training modules for Bio-resource Entrepreneurship Development in Hybrid Dendrobium Cut Flower Production

Institute of Horticulture Technology has developed four training modules for production of Dendrobium orchid cut flowers. These training modules prepared by experts are-

- Module 1.** Establishment of Orchid Net House.
- Module 2.** Production Technology of Hybrid Dendrobium Orchids.
- Module 3.** Post Harvest Management and Value- addition in Hybrid Dendrobium.
- Module 4.** Market intelligence and Marketing of Dendrobium Cut Flowers.

Lack of quality planting material is a major limiting factor in commercial production of orchids, of the six methods available for orchid propagation i.e. division, back bulbs, aerial cuttings, keiki, micropropagation and seed. Micropropagation is the best for commercial production. It needs Hi-Tech nursery production facilities

# Innovative Technologies in Quality Planting Material “V” Type Transplants

Farmers usually face major constraints in procuring certified seedling of vegetables and other horticultural and forest plants at appropriate time, these result in poor returns and moreover they are not able to match the crop requirements as per the market demand. The need for healthy, vigorous, disease free nursery raised from high quality seeds can best be assured when raised in protected structures in sterilized media.

## “V”-Type Nursery

Innovative Technology like V-Type nursery is used for mass production of seedlings/saplings of vegetables, fruits, flowers and tree species. Seedlings are produced in a short period of time, have a compact shoot with the normal number of leaves but short internodes. The seedlings are deep green in colour with a large well developed root system to facilitate transplantation. Lakhs of plants can be produced from specialized nursery greenhouses to meet the year round demands of farmers.

Institute of Horticulture Technology has such facility in it's campus. Farmers are provided hands on Trainings in the innovative nursery production technology. This high Quality Planting Material can also be raised by farmers if their capacities are build. IHT is dedicated to capacity building of all stakeholders in production of “V” type nursery for raising a profitable crop.

## Features of Plug Transplants

- Plug or cell transplants are seedlings or small vegetatively propagated plants which are raised in individual small cells, called plugs. The plugs are filled with a soilless medium, and are eventually transplanted into other growing systems.
- Its soil mass can be pushed out and planted without disturbing the roots.
- It is produced in a short period of time, has a compact shoot with the normal number of leaves but short internodes.
- Seedling is deep green in colour and has a large, well developed root system to facilitate transplantation.

## Advantages of Plug Transplants

- Ensures uniform growth and higher quality of plants,
- Good rooting ensures better survival & growth after transplantation,
- Gives a better option to produce healthy seedlings that gives quick start to the crops grown in open,
- Results in a seedling with a larger root system especially relative to the size of the plant,
- Higher survival rate of plants because of reduced damage in transplanting of seedling and lower incidence of diseases,
- Earlier establishment and earlier harvest after transplanting,
- Small production area (4 acres) can cater to the needs of a huge area.



“V” Type transplants comes out intact with little or no shock to root system



Seedlings in the plug trays can be timed as per field environment and market needs



Mass scale production of healthy and vigorous seedlings under protected structures is assured



Uniformity of quality seedlings give a uniform crop stand in open field or when grown in greenhouse.

### Hi-Tech Nurseries for Year Round Production

There is an increase in the demand for certain commercial plants, for example Fruits- Tissue cultured banana, Virus free Assam lemon, Citrus, mango, guava, apple etc Vegetables-Tomato, Cucumber, Capsicum, Brinjal, Gourds, Solanaceae crops etc. It is not possible to fulfil this requirement by ordinary or common nursery practices. There is necessity to have special techniques and methods to meet the demand and only Hi-tech nurseries can satisfy this type of demand. These nurseries grow plants in germination chambers, designed to protect young plants from harsh weather, while allowing access to light and ventilation. These germination chambers allow automated control of temperature, ventilation, light, watering and feeding. The facility also have automated tray filling, seeding and conveyor system to transfer the seeded trays to germination chambers for germination and subsequent hardening. A common facility for a group of farmers can be established under Farmer Producer Organization (F.P.O).

Timely access to seed and planting material of good quality is the basis of successful Agriculture/Horticulture production and development. Plug nursery developed in nursery green house stands in good stead. A sustainable way forward.

# Quality Assurance of Vegetable and Flower seeds

Dr. U.K. Kohli, Director, Institute of Horticulture Technology

Seed is the key component among all inputs for sustainable crop production. It is sexually produced matured ovule consisting of an intact embryo, endosperm and cotyledon with protective covering (seed coat). Seed also refers to propagating materials tuber, bulbs, rhizome, roots, cuttings, setts, slips, all types of grafts and vegetatively propagating materials used for production purpose. Seed is the vital and most important input for crop production. It is a bridge between the two generation of plant life and a medium of transferring character from one generation to next generation.

## Seed quality

Seed quality can be defined as a relative term and means the degree of excellence when compared to an acceptable standard. Seed quality is sum of all the properties contributing to seed performance. The quality of seed can decide whether the farmer's crop will be good, bad or indifferent. Quality seed accounts for 20-25 per cent of productivity. Seed quality is determined by following characteristics.

### 1. Physical attributes

- A minimum damaged seed
- A minimum amount of weed seed or inert material
- A minimum of disease seed
- Near uniform seed size

### 2. Physiological attributes

**Germination percentage or viability:** It is an indicator of the seed's ability to emerge from the soil to produce a plant in the field under normal condition.

**Seed vigour:** Seed vigour is capacity of seed to emerge from soil and survive under potentially stressful field conditions and to grow rapidly under field condition.

### 3. Genetic attributes:

- Seed of same variety
- Adapted to local conditions
- Pest and disease tolerance
- High yielding ability

### 4. Storability

- Moisture content
- Temperature of environment
- Seed treatment

**Seed Purity:** It has two aspects viz.

- Physical purity-Seed must be free from physical contaminants such as soil particle, plant debris, inert material and other crop or weed seed.
- Genetic Purity- Seed should be genetically pure true to type and must possess similar varietal characters.



## Characters of Quality Seeds

- Seed should be adoptable crop/ variety/hybrid and their duration should be according to the agro-climatic and cropping system of the locality
- They are genetically pure (true type) with high sowing quality, good yield potential, evenness in growth pattern, maturity and should meet the purpose of evaluation
- The seed should be free from seed borne diseases and physiological disorders due to deficiency of plant nutrients or bleaching due to adverse weather.
- The seed should be large, plump, bold uniform in size, shape, colour, texture and proper test weight.
- The seed should be clean and free from inert matter. eg. dirt, girt, trash a soil and sticky substances such as pulp and juice.
- It should be free from admixture; noxious or objectionable weed seed, other crop seeds and insects.
- It should be whole, not broken, half rotten, half filled affected with damp.
- The seed should be as fresh as possible or of the proper age.
- The seed should contain required amount of moisture.
- The good seed are physiological good in terms of germination, vigour, viability and sound health.

## Benefits of using quality seeds

- The good quality seed has high return per unit area as the genetic potentiality of the crop can be fully exploited.
- Less infestation of land with weed seed.
- Less disease and insect problem.
- Minimization of seed/seedling rate i.e., fast and uniform emergence of seedling.
- They are vigorous, free from pests and disease.
- They can be adopted themselves for extreme climatic condition and cropping system of the location.
- The quality seed respond well to the applied fertilizers and nutrients.
- Good seed prolongs life of a variety.
- Uniform in plant population and maturity.

Vegetable represent a diverse group of plants belonging to a large number of families. The breeding to a large number of families. The breeding system i.e. self-pollinated, cross-pollinated, often cross pollinated affect the genetic purity and maintainance of varieties. Hence knowledge of the same is important in understanding the nature of varieties. Classification based on breeding system is detailed below in the table below. Farmer should know the crops in which varietal genetic purity is easily affected i.e. chances are few in self-pollinated compares to often cross and cross pollinated crops.

Classifying Vegetable Crops based on Breeding Systems		
Predominantly Self-pollinated (Farmer can save own seed)	Often-cross pollinated Follow isolation distance	Largely Cross-pollinated Follow isolation distance
Degree of Selfing 90-100 %	Adapted to self-pollination but degree of cross pollination occurs up to 5 % or even reaches up to 30%	Degree of crossing can be upto 100%
Lettuce, Garden pea, French bean, Tomato, Potato	Okra, Chillies, Capsicum, Brinjal, Lima bean	Cole crops, Root vegetable. Onion, Cucurbits, Amaranths, Spinach beet Spinach, Asparagus, Parwal

The seed size is very important in crop production as it determines the seed rate and planting distance and seed handling for various operations. A classification as per seed size is brought out here under. Classification based on approximate seed size (ungraded) seed no./10 g sample:

Classifying Vegetable Crops based on Breeding Systems				
0-500	700-2400	2400-4500	5000-15000	20000+
Broad bean-8 Lima bean-8 Pumpkin-30 Common bean-35 Sweet Corn-50 Garden Pea-50 Squash-70 Water melon-225 Okra-170 Artichoke-250 Mungbean-300 Asparagus-500 Cucumber-350 Melon-350	Salsify-700 Gardenbeet-750 Radish-1100 Pepper-1400 Brinjal-2200 Broccoli-2300 Parshnip-2300	Fennel-2500 Onion-2700 Cabbage-2800 Knol-khol-3100 Tomato-3200 Rutabaga-3300 Cauliflower-3500 Leek-3600 Cress-4000 Bunching Onion-4500	Turnip-5000 Parsely-5400 Chicory-6000 Endive-7500 Lettuce-8600	Celery-25000 Watercross-38000

The farmer must have the knowledge about following so as to purchase the seed he desires to get for his requirement.

### Variety

A variety is a group of plants that share common qualities which are different from other group of plants of the same species. Usually a vegetable variety selected for uniformity, better seed setting quality, resistance, tolerance to adverse weather conditions and reproducibility. Different varieties for crop production are available as

**1. Open pollinated Varieties:** Varieties developed when pollination occurs by insect, bird, wind, humans or natural mechanism. These varieties are more genetically diverse as there is no restriction in the flow of pollen.

**2. Heirloom Varieties:** Heirloom varieties are open pollinated. These vegetables have been grown and passed down through farmers or gardeners for hundreds or thousands of years

**3. Hybrid Varieties:** Hybrid varieties are developed through the process of hybridization. Hybridization is the controlled method of pollination in which the pollen of two different varieties is crossed by human intervention. Commercially available hybridized seed are labeled as F1 is deliberately created to breed a desired trait. The first generation of hybridized plant tends to grow better and produce higher yield than the parent varieties due to the phenomena called 'hybrid vigour'. However any seed produced from hybrid plants are genetically unstable and cannot be saved for use in following years.

Commercial utilization of F1 hybrid is well recognized and the economic utility of hybrid vigour has been exploited in many vegetable viz. Tomato, Brinjal, Capsicum, Cabbage, Chilli, Muskmelon, Watermelon (main vegetables) and Okra, Bottle gourd, Carrot, Onion and Summer squash (minor vegetable).



**4. Genetically Modified Varieties:** Vegetable varieties having foreign genetic material are genetically modified varieties. These varieties are developed by introducing DNA on one species into plants.

Genetically Modified Varieties have been developed in many agricultural crops, among horticultural crops Tomato, Potato, Squash, Beet, Sugar beet etc. Private companies dealing with GMO Seeds are Monsanto, Byer, Syngenta, J.R. Simplot, Asgrow, Upjohn

**5. Vegetatively propagated vegetables:** Vegetative propagation in method in which vegetative parts are used as planting material, these may often called as seed. Vegetables like colocasia, sweet potato, pointed gourd, ginger and turmeric are propagated vegetatively.

With the privatization of seed industry many private companies get involved in production of high quality seed. These varieties contribute to higher production in agricultural and horticultural crops.

**6. Enhancing seed quality: The seed quality can be enhanced in following ways:**

**i) Seed Treatment**

Chemical or biological substances that are applied to seeds or vegetative propagation materials to control disease organisms, insects, or other pests. Seed treatment pesticides include bactericides, fungicides, and insecticides

**ii) Chemical Seed Treatment**

The seed health is very important and it should be free of seed borne diseases for this seed treatment with pesticide is generally done. Seed or planting material serves as a source of pathogen inoculums in field or cultivating crop so it is very important to treat seeds before planting. Captan, thiram, mancozeb, vitavax, carbendazim are few common fungicides which are generally use to seed treatment.

**iii) Hot Water Treatment**

Hot water treatment kills most bacterial disease-causing organisms on or within seeds. This treatment is suggested for seeds of eggplant, pepper, tomato, carrot, spinach, lettuce, celery, cabbage, turnip, radish, and other crucifers. Seeds of cucurbits (squash, gourds, pumpkins, watermelons, etc.) can be severely damaged by hot water and thus should NOT be treated.

Hot Water Treatment of Seed			
S No.	Vegetable	Temperature (°C)	Time (Minutes)
1	Egg plant, Spinach, Cabbage, Tomato, Brussels Sprout	50	25
2	Broccoli, Cauliflower, Carrot, Kale, Knol Khol, Turnip	50	20
3	Mustard, Radish, Capsicum	50	15

**Sources of seeds availability**

The quality seed can be obtained from public and private agencies. However, selection of variety is the simple most important decision to make the venture successful and it rests solely on the vegetable grower.

**References:**

- Hasanuzzaman M. (2015) Seed Quality, Department of Agronomy, Sher-a-Bangla Agriculture University
- <http://blog.seedsavers.org/blog/open-pollinated-heirloom-and-hybrid-seeds>

# Modern Technology of Plug Nursery Production

Ms. A. Yadav, Sr. Horticulturist, Institute of Horticulture Technology

Conventionally the seedling for raising successful crop of most vegetables is raised in open in the seed beds. With the advent of hybrids, the seed of most vegetables has become high value. Raising healthy nursery transplants has thus become imperative of a successful production programme. Now most growers have made the transition to greenhouse-grown transplants using various types of containers, primarily plug trays. With this system, each transplant grows in an individual cell so there is less competition among plants and greater uniformity. Less labor is required for mixing and sterilizing soil, filling flats and pulling plants.

## Advantages of V-type nursery:

- Plug transplants establish better in the field because roots are not damaged in pulling.
- Shorter growing season and more efficient use of land.
- Improved crop uniformity.
- More accurate prediction of harvest date.
- Facilitates the use of a wider range of herbicides.
- Extends the growing season.
- More efficient use of expensive hybrid seed.

## Tray Selection

The cell size influences the field performance of the transplant, especially earliness. When larger cells are used the plant has more room to grow, so it is possible to produce an older, more mature transplant without it becoming spindly or root-bound. In general, larger transplant trays result in earlier-maturing crops. Larger cells, however, take up more greenhouse space and are more expensive to grow.

**Table 1: Recommended size of Pro tray for vegetables:**

S.No	Vegetable crops	Cell size (inches)	Optimum cell size for early production (inches)
1	Tomato	1.5 - 4.0	3.0
2	Brinjal	1.5 - 4.0	3.0
3	Sweet pepper	1.0 - 4.0	2.0
4	Chilli	1.0 - 3.0	2.0
5	Cucurbits	1.5 - 4.0	3.0

## Growing Media:

The growing media or soilless mix is generally made up of a combination of peat, vermiculite and horticultural perlite. Media containing coarser-textured (long-fibred) peat provide better drainage and aeration, therefore promoting better root development.

## Why do the growers turn to growing media?

- The difficulty and cost of controlling soil borne pests and diseases
- Soil salinity
- Lack of fertile soil
- Water shortage
- Cultivated area constraint

## Characteristics of growing media

- Fairly constant in volume
- Free from weed seed, nematodes and soil born diseases
- Having proper drainage and aeration.
- Sufficient nutrients
- Low in soluble salts but adequate CEC
- Biologically and chemically stable on sterilization

## Types of growing media

Plants are raised in a solid, inert or non-inert medium instead of soil. It may be organic or inorganic in nature. Examples:

**Peat:** It is remains of aquatic marsh bog or swamp vegetation in partial decomposed state. It has high moisture holding capacity.

**Cocopeat:** It is by product of coconut husk. Cocopeat is best for providing aeration.

**Perlite:** It is an inorganic grey-white silicacious material of volcanic origin. It is neutral in ph. Perlite is used to reduce bulk density. It does not retain moisture or hold any plant nutrient. There is no real value of having perlite as part of the growing media.

**Vermiculite:** Horticultural vermiculite has long been valued by the nurse industry. It has most value in short-term mixes, such as those needed for seedlings. As a material with a high base exchange capacity, it is able to reduce the loss of nutrients through leaching. It also contains small amounts of magnesium and potassium.

Seedlings grown in plug trays using soil-less media are healthy and do not suffer transplanting shock. Ideal technology for high value crops, especially for greenhouses.



Pro tray



Cocopeat



Vermiculite



Perlite



**By wetting the plank the grower has a ready substrate**

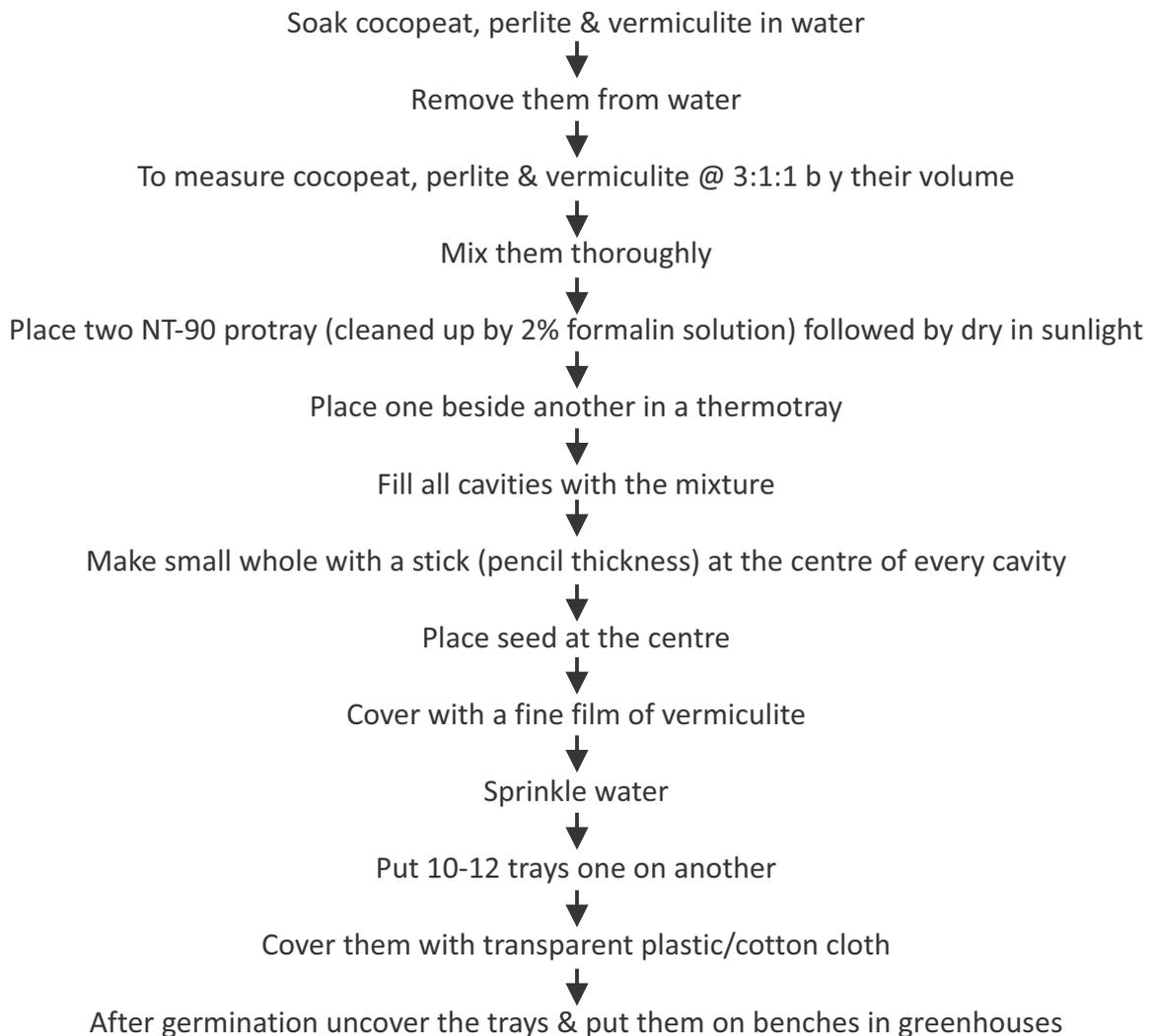
Hardening-off- Transplants must be ‘hardened-off’ so that they can withstand the transition from a relatively sheltered and protected environment to a sometimes harsh open situation. Generally, hardening is imposed from about 1 to 2 weeks prior to transplanting seedlings, by gradually exposing them to higher (or lower) temperature and the higher light intensity prevailing in the field. It should, however, not involve any treatment that may reduce the rate of photosynthesis, such as nutrient stress. Care should be taken not to over-harden plants, as this may delay maturity and in some instances even reduce crop yields.

### **Transplant Age and Scheduling**

The optimum age for vegetable transplants depends on both the crop and the cell size to be used. In general, larger cells will enable production of a larger, more mature transplant. Transplants grown in larger cells have been reported to give higher early yields compared to smaller cells: however, the overall yield is largely the same.

Seedlings receive better care and protection (from animals, weeds and pests) in the nursery. The average garden soil is not an ideal medium for raising seedlings especially from the point of view of soil tilth. At an early stage of development most vegetable crops require special attention that is not possible in the main field.

## Steps of raising seedlings in plug trays



Plug transplants of non-conventional nursery vegetables such as cucurbits and sweet corn can also be produced in Greenhouse to time the crop and take competitive and comparative advantage in market.

### References:

1. <http://agriculture.vic.gov.au/agriculture/horticulture/vegetables/vegetable-growing-and-management/seedling-production-using-cell-trays>
2. <http://www.omafra.gov.on.ca/english/crops/facts/transplants-plugtrays.htm#trans>
3. Singh, B., Kumar, M. and Yadav, H. L. (2005). Plug-tray nursery raising technology for vegetables. Indian Horticulture, 49(4), 10–12.

# Temperature Management in Greenhouse

Er. Sanjay Sudan, Saveer Biotech Limited

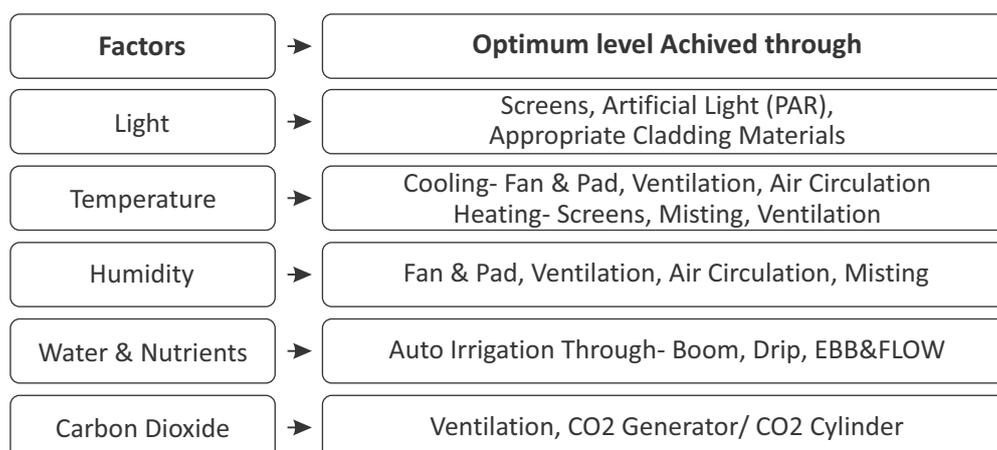
Greenhouses or protected structures of various types have to be deployed for production, maintenance and timing of quality planting material (QPM). Under Indian conditions high temperatures are most difficult to tackle in greenhouse climate control. This article brings the elements of climate control in GH with emphasis on management of high temperatures.

## Why temperature rises inside the greenhouse?

Greenhouses work based on a physical principle called greenhouse effect. The solar radiation passes through the glass roof and walls and is absorbed by the floor, earth, and contents, which become warmer and re-emit the energy as longer-wavelength infrared radiation. Materials which are used for greenhouse walls do not transmit infrared radiation, so the infrared cannot escape via radiative transfer. As the structure is not open to the atmosphere, heat also cannot escape via convection, so the temperature inside the greenhouse rises. This is known as the greenhouse effect.

## Five major factors to be controlled in greenhouse environment are:

1. Light
2. Temperature
3. Humidity
4. Water & Nutrients
5. Carbon Dioxide



## Management of High Temperatures

Lowering of temperature to the proximity of  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and maintaining humidity around  $60\% \pm 10\%$  remains the objective of most vegetable and other horticultural crops growers under cover in the protected structures. The high temperatures can be managed through passive and active cooling systems. Recently Geothermal cooling has also been used in advanced countries.

### 1. Passive Cooling

- Natural Ventilation- Vents are provided at the ridge and on the side of polyhouse. These are made insect proof by 50 mesh netting. The top vents are more important. The entire system works like a chimney. The cold air is heavy and comes from the side vents the hot air goes out from the top vent in the ridge. The side vents can be folded up and down. The top vents can be fixed and movable. Generally top vent size is 100 cm.
- Use of Screens- Earlier the shade nets were used to cover the polyhouse from outside and also from inside.

### 2. Active Cooling

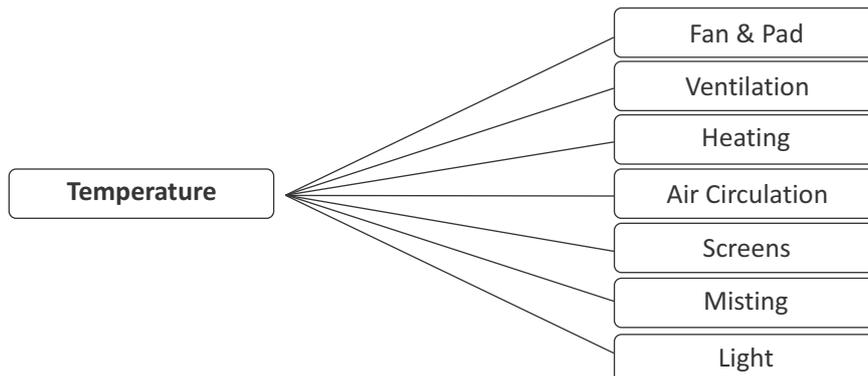
- Fan and Pad Cooling System- This is 60 years old technology, in this polyhouse/ greenhouse/ poly tunnel are provided

with a specially designed pads on one side of polyhouse and a big fan (sometimes two fans) are provided on the opposite side. The pad has water flowing through it, the fan sucks the air and cooling is caused due to water vaporization. In fan and pad system no outlet in the form of vent or exhaust fan is provided. Good cooling effect can achieve with one air exchange per minute.

- Fogging and Misting Systems- This is one of the recent technologies. In fogging the droplet size is in between 10-25 micron compared to misting.

### 3. Other cooling methods

- There are some other cooling methods these are used to lower the temperature such as use of sprinklers at the top of polyhouse along with top vents and use of white wash on the cladding material but these are not very effective.



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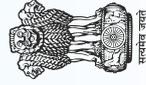
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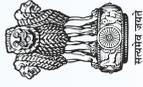


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